[FOUNDED IN 1906 AS THE AMERICAN QUARTERLY OF ROENTGENOLOGY]

THE AMERICAN JOURNAL OF ROENTGENOLOGY

OFFICIAL ORGAN OF THE
AMERICAN ROENTGEN RAY SOCIETY

EDITOR

JAMES T. CASE, M. D. - - BATTLE CREEK, MICHIGAN

EDITORIAL BOARD

FREDERICK H. BAETJER, M. D. - Baltimore
DAVID R. BOWEN, M. D. - Philadelphia
E. W. CALDWELL, M. D. - New York
R. D. CARMAN, M. D. - Rochester, Minn.
SIR J. MACKENZIE DAVIDSON, M. B. - London
A. W. GEORGE, M. D. - Boston
PRESTON M. HICKEY, M. D. - Detroit
G. E. PFAHLER, M. D. - Philadelphia, Pa.
J. S. SHEARER, PH. D. - Ithaca, N. Y.
E. H. SKINNER, M. D. - Kansas City, Mo.
F. C. ZAPFFE, M. D. - Chicago

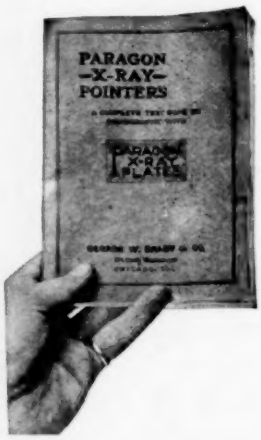
VOLUME IV NUMBER 5

May, 1917

PUBLISHED MONTHLY BY PAUL B. HOEBER
NEW YORK CITY

PARAGON X-RAY PLATES

No X-Ray Plates are faster or better than the "PARAGON"; noted for sharp contrasts and rich black background—interpreted with certainty.



NEW BOOK FREE

A new edition of our famous "Paragon Pointers" is about ready. More complete than ever. Up to the minute in every detail. The latest and best information on X-Ray technic. Every Roentgenologist should have one.

Send in your name for a copy, free, as soon as it is off the press.

X-Ray Service

No matter what the make or type of your apparatus, if you are not getting A-1 results, instruction in our methods will help you. This is a part of "Paragon Service."

Get The Best Results

Standardize your exposures—use simple time development and get ***excellent*** work—not the kind that just "gets by."

"Paragon Service" will show you how. It may mean a radical change from your accustomed ways—but it will get fine roentgenograms, which is what you are after.

This method saves your time—enables you to turn over ***all*** your developing to your assistant—leaves you free to devote ***your*** attention to patients. Besides, the savings in plates alone make it well worth while.

Get in line—use Paragon technic, and be ***sure of results, before exposure.***

"Universal" X-Ray Plates

For economy, try our new "Universal" X-Ray Plates. 20% lower cost. A-1 quality. A trial will surprise you.

Ask for quotation on "Universal" Plates, delivered.

GEO. W. BRADY & CO.

761 S. Western Avenue Chicago

THE AMERICAN JOURNAL OF ROENTGENOLOGY

Editor, James T. Case, M.D., Battle Creek, Mich.

VOL. IV (NEW SERIES) MAY, 1917 No. 5

CARCINOMA OF THE UTERUS TREATED BY A COMBINATION OF RADIUM AND ROENTGEN RAYS*

BY RUSSELL H. BOGGS, M.D.

PITTSBURGH, PA.

THE large amount of clinical data collected has proved certain well established facts in the treatment of carcinoma by radium. Radio-active substances have been used in the treatment of malignancy for about ten years. During the first seven years the entire subject was in the experimental stage. The few who studied did not have a sufficient amount of radium and the operators were unfamiliar with the methods of screening and the value and importance of roentgen radiation as given from the outside for the purpose of destroying metastases. This was before the physicists, chemists, physiologists and clinicians had worked together and, consequently, it is only for about three years that statistics of any value whatever are available.

There is no longer any doubt that radium and the roentgen rays exert a powerful influence over cancer cells. There have been many thousand cases of pelvic carcinoma treated by radiotherapy, but most of these have only come in the very last stage of the disease. Even in this hopeless group a patient would occasionally get well, while nearly all received palliation. Many of these cases could have been referred sooner and the patients would have had a much better chance, had the physician been familiar with the value of radium. The investigations of the so-called cancer cures have been especially difficult because of the length of time required to check the ultimate results. Radium has been lauded in the highest terms by many; abandoned by some who only witnessed the treatment of possibly a cachectic patient; and denounced by many without even a trial. At present the value of radium is being recognized by most of the gynecologists, proctologists and urologists.

Experience of the past three years has shown that we cannot treat successfully with radium at a greater distance than two or maximum three centimeters. It has been universally accepted that cancerous growths can be promptly and also apparently permanently cured at this depth from the radium tube. However, if the disease is advanced and there is infiltration of the growth into adjacent lymphatics, the cure is only apparent. The local growth may disappear, but if metastasis takes place before treatment is given, it will progress, if radiation is effective only for two to three centimeters from the tube, without regard

* Read at the Seventeenth Annual Meeting of the American Roentgen Ray Society, Chicago, Ill., Sept. 27–30, 1916.

to the quantity of radium applied or to the length of time it is applied. Larger quantities of radium have been tried and the time of exposure increased so as to influence cancerous cells at a greater depth, but the universal reports show that not much success has been accomplished in this direction. The overlying tissues were damaged beyond recovery, regardless of the kind of filters employed. The rays of the radium in contact with the growth were too intense where it entered, and too weak at a greater distance from the tubes than two or three centimeters. Placing the radium at a distance from the surface so the rays would be nearly uniform at the point of entrance and at the distance required, renders the radiation too weak even if large amounts are employed. The same objection is not held to apply to the present roentgen tube which, when powerfully excited, gives off many thousand times more rays than any quantity of radium any one has ever used. It has been estimated that with ninety-two grams of radium it would be necessary to place the radium at the same distance in order to obtain at a depth of ten centimeters the same intensity of radiation as with the roentgen tube. By this I do not mean that it would be necessary to give the radium in five to ten minutes as we are doing at the present time with the roentgen rays.

It has been found that radiation will destroy cancer cells at a depth of ten centimeters from the surface of the skin and that the intensity is reduced from 100 to 15, that is about one-seventh of that on the surface.

In order to show the manner in which gynecologists are taking up the treatment of radium in uterine cancer, let me quote a paragraph from John G. Clark's paper "What do the Newer Methods of Treatment Offer the Patient with Malignant Disease of the Uterus?" (*N. Y. Med. Jour.*): "Basing our statement upon the literature and upon our own limited experience in the use of radium, we should set down as definite postulates the following conclusions:

"(1) Up to the present there is not sufficient evidence in favor of radium to justify one in using it as a substitute for surgical measures in operable cases.

"(2) As a forerunner to and a follower up of an operation it is unquestionably advisable.

"(3) In inoperable cases it should invariably be tried, for apparent cures have occurred in some markedly advanced cases, and in those cases that are not ultimately cured, there is nevertheless a decided amelioration of symptoms—in many instances, the offensive discharge and hemorrhage completely disappear.

"(4) A serious disadvantage in the use of radium is that it occasionally produces a widespread necrosis, leaving vesical and rectal fistulæ in the wake of its destructive action. This, however, usually occurs only in advanced cases of carcinoma, and need not, therefore, deter us from the use of the remedy."

I believe that local injury to the patient will seldom occur if the proper amount and kind of filtration is used and if the dosage is adapted to the individual patient. We know that tissue will stand large doses of radium, if not too often repeated, leaving no scars or adhesions. Radiation carried to the extent of severe injury of normal tissue may defeat its own ends. The tissues can be more severely inflamed and yet make a complete recovery by radium than by any form of roentgen therapy.

Clark's remarks could be applied to carcinoma of the rectum, bladder and prostate. Operate on every operable case, radiate all cases after operation. Some surgeons advise against operating on borderline cases because usually they can be clinically cured by radium. All advise radiating advanced cases, for an occasional cure will be obtained and some can be made operable. Radium supplemented by roentgen therapy in far advanced cases will give great palliation but a cure will not be effected. Some of these cases are clinically cured in that all visible signs of the disease will disappear, but the patient will later succumb to the deep metastases.

The amount of radium element, the

screening, the distance from the growth, the time of exposure and the nature of the tissues to be acted upon must be carefully considered when deciding upon the dosage. The law of reaction is the governing factor in its use, and success can only be attained when the radiotherapeutist is familiar with his agent and knows the exact pathology and extent of the disease. He must also know the limitations of radium and not promise a cure when nothing but palliation may be expected.

There is a difference of opinion in regard to the technic of applying radium in uterine, rectal and vesical carcinomas. Kelly, Kroenig and others advise the use of large quantities of radium, while others advocate the use of smaller quantities, applied for a longer period. All have generally agreed that less than 50 milligrams of the element should not be employed in uterine carcinoma, as stimulation of the growth instead of destruction might occur. Pinch, of the London Radium Institute, where large quantities of radium are available, prefers to use from 50 to 100 milligrams. Bumm and many others have come to the same conclusion. What the final dosage will be decided upon to produce the best results remains to be seen, but in reviewing the literature it appears that many have decided upon doses of from 2000 to 4000 milligram hours, to be given within the first week or ten days. The dosage must always be decided upon for each individual case. Some give this amount at one séance, while others divide it up into six or eight. The results seem to be about the same, but the condition of the patient possibly should determine what course to pursue. If used continually until a full dose is given, it is advisable to remove the radium and give a cleansing douche. The treatment is repeated in three or four weeks, according to the indications. There is also some difference of opinion in regard to screening, but all agree that at least 2 millimeters of lead or its equivalent of brass or bronze is necessary. The latter is being prepared by many, as it is claimed that bronze gives off less secondary radiation. The metallic tube is covered with sufficient rubber, gauze or other substance to cut off the undesirable secondary radiation. One millimeter of pure rubber, covered by gauze and a finger cot, answers this purpose.

The distance of the radium from the growth is only the thickness of the filter, but this must be taken into consideration when deciding upon the length of exposure as well as the amount of radium element. During the past year some of those purchasing radium have visited me and they seemed to think all they had to do was to insert the radium. They were unfamiliar with a radium or roentgen reaction on the surface of the skin or mucous membrane, to say nothing of the deeper reaction. They would start in about the same way as a gynecologist would without knowing the principles of aseptic surgery, expecting to learn by sacrificing his patients. Roentgenologists who have had experience in therapy are much better qualified.

I cannot too strongly advocate that radium be supplemented by the roentgen rays, feeling sure that smaller quantities applied locally with proper roentgen therapy from without are equal, if not superior, to any quantity of radium ever used up to the present time as far as the end results are concerned. Kelly uses radium at a distance of two to five inches from the surface in large quantities from without, in the same way as many are using roentgen therapy from a Coolidge tube. Whether his results are equal or superior remains to be seen. As light decreases inversely with the square of the distance, the tissue would be rayed more uniformly with the source of energy at 8 or 10 inches than 2 or 5 inches. Besides, greater areas can be treated. Although the better method of treatment still remains to be determined, I believe most of us who have treated a number of cases of fibroids will expect more from the combination of radium and the roentgen rays than from radium alone, treated by any method. As before stated, this is the method which is carried out in European clinics and many of us have witnessed their results. Besides, it is not nearly so expensive, as it does not

require at least several grams of radium. In short, it seems a more practical method.

CONCLUSIONS

Valuable statistics are being obtained, but the time is not long enough to speak of definite cures, although several cases have been recorded over eight years ago.

As a forerunner to, and a follower up of operation, radium is of unquestionable value. Relief of the symptoms in advanced cases is so marked that every practicing physician should at least familiarize himself with this fact.

The offensive discharge and the hemorrhage usually completely disappear. The discharge at the beginning which is so offensive to the family and nurses as well as to the patient usually completely disappears within two or three weeks. Almost every gynecologist who followed the treatment of these cases will state this as a most remarkable feature in his report.

ROENTGENOTHERAPY OF HOPELESS MALIGNANCY*

BY GEO. C. JOHNSTON, M.D.

PITTSBURGH, PA.

BY the term "Hopeless Malignancy" the author desires to designate (1) cases of undoubted malignancy so extensive in character as to defy the possibilities of surgical extirpation; (2) cases in which operation has been necessarily incomplete with no possibility of further surgical procedure; (3) cases with recurrence of disease in an inoperable form after having undergone one or more operations; and (4) cases where the mere removal of the diseased organ, such as the uterus or stomach, is not expected to result in cure.

An excuse for presenting this subject is furnished by certain lessons learned during more than sixteen years' experience in active radiotherapeutic work and the treatment of a very large number of patients suffering from almost every conceivable form of malignancy. The purpose of this paper is not to give any statistics or to display any particularly brilliant results but rather to dispel a certain atmosphere of fatalism and therapeutic nihilism which has been permitted to enshroud that unfortunate class of patients generally characterized as "hopelessly malignant."

It is only the young practitioner who will glibly tell a patient's friends how long he may be expected to live with any given disease or that a patient must inevitably die because he is suffering from a certain disease in a certain location. It is only after he has seen such patients recovering in spite of his treatment that he learns to be more guarded in his prognosis.

There are two classifications of malignancy that usually parallel each other, but are sometimes widely divergent. I refer to microscopical versus clinical malignancy. Microscopical malignancy recognizes certain cellular arrangements and certain deviations of cellular elements into forbidden grounds, but takes no cognizance of an important supporting factor: the absence of a partial or complete immunity of the patient to what we know as malignancy. This "immunity," partial or complete, is not a figment of the imagination nor a "glittering generality." It is a clinical fact repeatedly observed and recorded by men competent to make such observations. Where this immunity is absent, malignancy proceeds unhindered to accomplish the destruction of the patient. Where it is present only to a slight degree, the progress of the disease may be slightly slower than usual. Where it is present in a more marked degree, the pathologic process may take years to accomplish what the same disease usually accomplishes in a few months in a patient un-

* Read at the Seventeenth Annual Meeting of the American Roentgen Ray Society, Chicago, Ill., Sept. 27-30, 1916.

fortunate enough to be deprived of such relative immunity.

In another interesting class of cases the immunity seems to develop during the progress of the disease, retarding and sometimes even overcoming the process. In still others, spontaneous cures of undoubted malignancy occur, and again, the relation between immunity and malignancy may be so evenly balanced that the patient lives for long periods, even years, suffering and successfully overcoming one carcinomatous focus after another, much as a sufferer from fibroid phthisis may live for years, polluting the entire community, while his neighbor may succumb to an acute miliary infection in as many weeks.

This matter of relative immunity must be recognized, admitted and studied, if we are to arrive at the goal of successful treatment of malignancy. The reason for its introduction in this article is because relative and sometimes almost complete immunity is actually inherent in some sufferers from malignancy and because, in my belief, it is sometimes increased by radiotherapy. Up to the present I have resorted to this procedure in a purely empirical and accidental way, and I trust that by sufficient investigation it will be placed upon a sound foundation so that the induction of this relative immunity may become a possibility in a larger number of cases.

The exciting cause of malignancy is unknown. The field of conjecture is equally open to all. The careful student of syphilis in its myriad manifestations with what practically amounts to metastasis, with its ability to attack every tissue of the body, with its tumor formations, gummata and ulcerations often indistinguishable from epithelioma and carcinoma, will find the apparent difference between syphilis and malignancy to be as follows: in syphilis the infectious agent, the spirocheta pallida, is recognized; in malignancy, a specific causative organism is not yet recognized. In syphilis, arsenic in the form of salvarsan inhibits the disease; in malignancy, arsenic does so occasionally. In syphilis, mercury cures; in malignancy, mercury is of little or no value. In syphilis, partial immunity or high resistance to the ravages of the disease is rather common; in malignancy it is uncommon. The eventual treatment of malignancy will be that of a chemotactic agent similar in nature to salvarsan, but this will not occur until the exciting cause is experimentally or accidentally discovered. In the meantime, reliance must be placed upon surgical extirpation, electric or thermic cauterization, and radiotherapy.

The surgical treatment of malignancy is about as successful as the surgical treatment of syphilis by excision of the chancre and probably for precisely the same reason. The surgery of malignancy is rather the surgery of prevention of spreading than the surgery of cure. For this reason the earliest possible diagnosis followed by wide extirpation of the area under suspicion is imperative. Very few cases of carcinoma of the breast for example are probably ever cured by surgical intervention alone, where the axillary glands are actually infected by metastatic carcinoma, and I see no reason to believe that any case of carcinoma of the breast was ever cured by surgical intervention alone, where the supraclavicular glands were actually infected by true carcinomatous metastasis. Hence the imperative necessity of preventive surgery by extirpation of the original focus in the breast before such metastasis occurs. The reason why a few cases escape recurrence following extirpation, where the glandular tissues were infected before operation, is that they possess or develop a relative immunity to the disease.

As evidence in support of the existence of such relative immunity let me describe a case in point:

Mrs. P. C. B., aged 42 years, referred by Dr. McMurray. *Seven years ago carcinoma of right breast removed by caustic paste, recurrence was prompt. Radical extirpation of right breast with dissection of axilla. One month later prompt recurrence* over area formerly occupied by breast with multiple external carcinomata. These have been

present for 5 years; *carcinoma of right lung and pleura developed 3 years ago.* Pleurisy with bloody effusion. *Fluid removed from pleura 31 times.* At present entire right chest is solid, completely opaque. Two years ago developed abdominal ascites. Tapped repeatedly. Abdomen opened by Dr. Stillwagon who reported general carcinoma of mesentery. *At the present time, 7 years after first lesion,* has hundreds of cutaneous nodules and numbers of carcinomatous plaques scattered over abdomen, numerous tumor masses palpable in abdomen. Wassermann entirely negative. A number of the more irritating cutaneous lesions were cured under extensive radiation. *General health is quite good. Leaving for Kansas to engage in the hard work of a home missionary.* This woman at the present time has as much gross malignancy as any 5 patients under treatment, yet her general condition is quite good and she will probably live for many years. Carcinoma does not seem instrumental in ending her life. I am unable to advance any hypothesis other than that of a partial immunity.

This patient should be placed at once under observation and the best men in the world should make studies of her in the attempt to find why the carcinoma is unable to kill this little woman. I have discussed this portion of the subject because it seems to me to give some clue to the recovery of certain apparently hopeless patients concerning whom I shall speak later.

The following case reports may prove of interest:

Mr. H. S. Carcinoma of stomach with metastasis. Large glandular mass over pyloric region, deeply jaundiced, emaciated, vomiting blood. Treated in 1909, 10 treatments with leather filtration, received in all not to exceed 30 *x* with remarkable diminution in size of tumor which became scarcely palpable. Jaundice continued and death followed.

Mrs. M. P. Carcinoma of uterus. Abdomen opened for abdominal hysterectomy, but disease was found to be so extensive that no attempt at removal was made. Uterus cauterized. Patient was given 1000 *x* over 6 ports of entry on front and 6 on back. Her hemorrhages have ceased, she feels so much better that she will not return for monthly examination.

Mrs. J. M., referred by Dr. Cheesman Oct. 20, 1914, operated by Dr. Cheesman May, 1914, for carcinoma of uterus. Abdominal hysterectomy performed, abdominal metastasis present. At the present writing there is some telangiectasis. Patient feels better, looks better, and is in good health. No evidence of disease found by Dr. Cheesman or myself. She considers herself well and is apparently cured. She received very extensive and intensive raying with multiple ports of entry, thick filtration, etc.

Miss O., referred by Dr. C. B. King, operated in 1904. Sarcoma of the vulva involving the labia majora. Three operations in two years, followed by recurrence. No further surgical procedure being possible, this patient was submitted to radiotherapy without filtration save that afforded by a few thicknesses of clothing. She developed a severe roentgen dermatitis, was confined to her bed for several weeks, during which time she suffered greatly, but the disease rapidly disappeared. She is married and is the mother of several children and at my last inquiry, a few months ago, was living and in perfect health, some 12 years from the time of her treatment.

Mrs. C., referred by Dr. Gregg. Aged 62 years. Carcinoma of pylorus, vomiting of blood and coffee ground material, constant burning pain. Tumor of pylorus easily palpable, has lost 30 lbs. Dr. Gregg did not consider this patient fit to undergo even a gastro-enterostomy. She was submitted to rather intensive radiation with cross-firing of the region of the tumor. Her stomach symptoms disappeared, the tumor mass softened and disappeared. She died three years later of pneumonia, without having developed any further stomach trouble.

Mrs. O. Carcinoma of inner canthus,

side of nose, going down deeply into the ethmoidal cells. Patient aged 50 years. An apparently hopeless condition. First treatment given Dec. 1, 1911. Rather intense radiation employed. She made a rather rapid recovery and remains perfectly well Sept., 1916.

Mr. J. S., age 53, referred by Dr. Boucek, July 13, 1908. Sarcoma of left side of neck of 4 months' standing, involving the sterno-cleidomastoid, larynx and esophagus, skin adherent and wrinkled, difficulty in swallowing. The case was inoperable. Drs. Ferree, Hartmeyer and Boucek concurred in advising *x*-ray treatment with the hope of rendering the case an operable one. The growth broke down under treatment, discharging pus and the patient was apparently perfectly well within 3 months. He remains perfectly well Jan. 16, 1916, 8 years later.

Mrs. V. M., referred by Dr. F. H. Frederick. Round-celled sarcoma at supra-sternal notch. Operated twice, recurred each time. At present inoperable due to involvement of clavicle and sternum. Growth disappeared under treatment extending over 7 months. Patient first seen November 10, 1909. Last seen October, 1913, at which time she was in perfect health with no evidence of recurrence.

Mr. A. H., referred by Dr. Heckel. Epibulbar sarcoma previously reported. This patient lived for 5 years following treatment of the sarcoma and died of senility with no evidence of return of malignant disease.

Mr. S. H., referred by Dr. Wm. M. Sweet, Philadelphia, Pa., July 8, 1908. Dr. Sweet operated in May, 1908, finding a mass extending to the apex of the orbit and toward the inner wall. After removing the mass he found that the disease had eaten through the upper orbit of the wall and the dura. When Dr. Sweet recognized the impossibility of removing all the disease, he cleaned out the orbit by curetting all the dead bone in reach. Following operation he was treated by Dr. Manges, then referred to me. Pathologist's report: Small-celled sarcoma. This man was rayed repeatedly and under constant observation. In 1912 the orbit filled up rapidly with a new-growth. He had some headache and the brow began to enlarge. Some intensive treatment caused the disappearance of this evidence of return. In 1915, there was distinct evidence of recurrence in the frontal sinuses. This was all held in check to a degree for a number of months, but in the early part of 1916 the patient showed distinct evidence of recurrence along the dura and at the base. Under treatment at the hands of Dr. Manges this man is alive and comfortable at the present time.

Mr. L. L. H., referred by Dr. A. E. Ewing. Round-celled sarcoma of lower right 9th, 11th, 12th ribs, subperiosteal. Tumor several inches in diameter. This patient was treated to the point of destruction of tissue, causing an *x*-ray burn which healed in rapidly to about one and one-half inches in size. The tumor mass disappeared entirely after the *x*-ray burn had healed. This patient is apparently well at the present time, 18 months later.

Miss A. G., referred by Dr. C. Q. Jackson. Malignant thyroid with mediastinal glandular involvement, inoperable, Dec. 6, 1909. This patient was cured by treatment extending over 5 months. She is living and well June 17, 1916.

Mr. A. M. Inoperable sarcoma of upper eyelid extending into the orbit. Recurrence following operation 1 year ago. Very marked exophthalmos. Upper lid ½ inch thick. Ulceration about the size of a penny near inner canthus, eyeball is fixed in the orbit. This man received the most extensive radiation, no regard being paid to the condition of the eye since there was merely light perception. At the present time, one year after beginning treatment, the eyeball is freely movable, eyelid has diminished to normal size, exophthalmos has disappeared, malignant ulceration of the lid has disappeared, pain has disappeared, and it is rather hard to believe, after an examination of his eye, that he could ever have had such an extensive amount of trouble.

Mrs. C. S. M., referred by Dr. J. H. Anderson, Nov., 1914. Recurrent sarcoma of breast. Halsted operation 6 months previously. Recurrence in scar of operation. Tumor mass half an inch in height, one inch in diameter. Glandular metastasis in neck and supraclavicular region. Under extensive radiation the tumor mass disappeared, being replaced by a smooth pliable scar. The glands at the present time, two years later, are scarcely palpable. Patient apparently in perfect health.

Miss A. M., referred by Dr. Aber, May 29, 1914. Recurrent sarcoma of shoulder and breast. She had repeated operations on the supraclavicular recurrence. There is a fungating tumor mass one inch high and two and one-half inches in diameter, situated above the clavicle. Under intense radiation this tumor disappeared but promptly recurred even under treatment, and in spite of the enormous doses carried even to destruction of the tissue the growth could not be kept under control. The patient died some 18 months after we saw her.

Mr. W. Sarcoma of abdominal wall involving entire right rectus. Operation by Dr. Langfitt. Degenerated mass of tissue removed. Postoperative radiation at the instance of his son, a physician. This patient was treated in 1902 and remains perfectly well at the present time.

Baby G. Age 2 years. Three operations by Dr. R. W. Stewart. Angiosarcoma near inner canthus of left eye extending down over the cheek and to side of the nose. Prompt recurrence following each operation. Fourth operation declined by Dr. Stewart who suggested radiotherapy. She is now a fine little girl in perfect health and without any scarring of the face.

These case reports have been selected without any regard to character of the malignancy or location, but simply as some evidence in support of the statement in the first part of this paper. Looking back over these records, I can recall the individual patients, each of whom was in such condition that it seemed almost foolish to attempt relief. And yet in spite of their desperate condition there was in many instances complete and permanent recovery. We cannot help mentally comparing them with a series of other patients, suffering from the same type of disease in the same location, equal in extent, character, time, etc., who derive little or no benefit from the treatment or promptly succumb to the ravages of the disease.

It is of course impossible to compare individuals with the expectation of any degree of accuracy in any deductions drawn therefrom. Nevertheless, such comparisons become strikingly forceful and the evidence seems to point inevitably toward a single possible conclusion. There is something lacking in the explanation of the reason that series *A* should recover and series *B* succumb, when disease, location, history and treatment were as nearly similar as possible. The explanation must be that series *A* was composed of individuals possessed to a greater or less degree, or developing during treatment, a relative immunity or resistance to malignancy, whereas the unfortunate members of series *B* either did not possess or failed to develop any such theoretical immunity or resistance.

Although this is pure conjecture, it seems to be the most sensible explanation. The records of the past 16 years show very many cases of "hopeless malignancy" in whom the most painstaking and thorough treatment did no more than relieve pain or possibly prolong life.

The few cases reported above do not represent by any means all the apparently hopeless cases that have derived very considerable benefit from treatment. The foregoing reports are made with the hope that they may stimulate interest in the treatment even of hopeless malignancy and that the idea of so-called immunity may give an impetus to others better fitted than myself for the study of this particular phase of the subject.

THE BLOOD IN CANCER UNDER ROENTGENOTHERAPY*

PRELIMINARY REPORT

BY ROLLIN H. STEVENS, M.D.

Roentgenologist to Grace Hospital, Associate Clinical Professor of Roentgenology in the Detroit College of Medicine

DETROIT, MICH.

WHEN the study contained in this communication was begun more than a year ago, we were impressed with the idea that frequent blood examinations of cancer patients being treated with the roentgen ray should give us more accurate information, first, concerning the progress of the case; and second, regarding the possibility of the ray as developing immunizing tendencies in the blood. Light might, in our opinion, have been shed upon the second question by a careful study of the behavior of the lymphocytes of cancer cases under the ray. This was suggested by Murphy's experiments on lower animals with cancer implantations and roentgen ray exposures.

Owing to unavoidable interruptions in blood-counting during the winter, and our inability to follow a sufficient number of cases long enough, we can only present a preliminary report at this time.

Beginning with Senn's paper in 1903 on "The Therapeutic Value of the Roentgen Ray in the Treatment of Pseudoleukemia," a considerable amount of literature concerning the action of the roentgen ray on the blood has accumulated.

After Roentgen Treatment	Blood				Blood-Forming Organs	
	Lymphocytes	Leucocytes	Polymorphs	Erythrocytes	Lymphoid Tissue	Bone Marrow
½ to 2 or 3 Hours	Decrease	Increase	Increase	Slightly Diminished	Destruction of Nuclei in Lymphocytes	Destruction of Nuclei in Lymphocytes—Degeneration of Polynuclear Cells.
12 Hours	Decrease	Decrease	Increase	Decrease (?)	"Explosion-like" Destruction of Lymphoid Tissue	Hyperactivity in Direct Ratio with Leucopenia; Increase Granular Myelocytes, Basophiles, Polynuclears Transitionals Eosinophiles, Mast Cells.
24 Hours	Decrease (Lowest) Large Mono-nuclears Appear	Decrease	Increase	Decrease (?)	Epithelioid Cells Appear in Lymph Nodes.	Series Hb. Contain-ingElements Uninfluenced.
24 to 36 Hours	Decrease	Decrease	Decrease	Decrease (?)	Destruction of Lymphoid Tissue Ends	Ditto
2 to 3 Days	Increase	Decrease (Lowest)	Decrease	Decrease (?)	Hypoplasia of Spleen Pulp	Ditto Hypoplasia Bone Marrow
3 to 6 Days	Increase	Decrease	Decrease	Decrease (?)		Ditto
6 to 7 Days	Returning to Normal	Returning Normal	Returning Normal	Return to Normal	Regeneration of Lymphoid Organs	Ditto
10 Days	Normal	Normal	Normal	Normal	Ditto.	Ditto
4 to 6 Weeks	—	—	—	—	Regeneration Complete	Hyperactivity Ceases, Regeneration Complete

TABLE 1.—SHOWING BRIEFLY THE EFFECTS ON THE BLOOD AND BLOOD-FORMING ORGANS OF MODERATE DOSES OF ROENTGEN RAY

We have attempted to briefly classify and epitomize the results of the various investigators.

Table 1 is a brief compilation of the main events occurring in the blood of small animals after prolonged raying of the body. It is gleaned from the experimental studies of Heineke, Linser and Helber, Tatarsky, Warthin, Benjamin, Sluka, Reuss and Swartz, Aubertin and Beaujard, Klein-

*Read before the Seventeenth Annual Meeting of the American Roentgen Ray Society, at Chicago, September 27-30, 1916.

burger and Zoepritz, Murphy and Ellis, Milchner and Mosse, Küpferle.

Similar blood changes occur, according to Aubertin and Beaujard, if the blood only (in the ear of a rabbit) is rayed, but regeneration is complete in twenty-four hours.

Murphy and Ellis found that "small roentgen doses" with a Coolidge tube (10 MA, 3-inch spark gap, 1 to 2 minutes) given to mice, destroyed their lymphoid system with the result that there were no circulating lymphocytes. Apparently they did not injure any other tissues nor cause any ill health.

These authors also found that mice and rats, injected with mouse serum and inoculated with mouse tumor, responded by a marked lymphocytosis reaction and developed an immunity against cancer inoculations. Naturally immune animals showed the same reaction, but slower, while the non-immune did not. If, on the other hand, these animals were submitted to the same doses of the roentgen ray after their immunizing injections, the usual lymphocytic reaction was prevented and the inoculated tumors grew rapidly.

They conclude that "all the evidence points toward the lymphocyte as a necessary factor in immunity processes, and the finding offers a probable explanation of the results of Apolant who found that it was more difficult to render splenectomized animals immune to cancer than intact ones."

In a later paper, as a result of further experimentation, Murphy and Morton emphasized these conclusions. They showed that the resistance of heteroplastic graft depends upon the activity of the lymphocytes. The embryo chick is naturally devoid of resisting power to the growth of grafted tissues from foreign species, but it acquires the immunity of the adult animal by the injection of homologous tissue rich in lymphoid elements such as spleen or bone marrow. The adult animal, deprived of the major portion of its lymphoid system by means of roentgen rays, no longer resists the growth of heterologous tissue, and such foreign cells will grow actively until the depleted lymphoid system of the animal is regenerated.

After inoculation, the lymphocyte count increased to over one hundred per cent. in the first twenty-four hours in the artificially immune. In the naturally immune the rise in lymphocytes was slower, being delayed a few days and even preceded by a slight fall, but the count went to one hundred to two hundred per cent. above normal. In susceptible animals the lymphocytes decreased and the polymorphonuclears tended to increase.

The authors further state the lymphoid crisis is not merely an accompanying factor in the immune period but is essential to the process. The polymorphonuclears show a tendency to increase in the animals with growing tumors.

If the roentgen ray tends to destroy the lymphocytes, even though temporarily, it might seem at first sight that notwithstanding the local action of the ray on cells of malignant growth, this immunity relationship between lymphocyte and cancer was in danger. And undoubtedly this work of Murphy and his collaborators must impress every roentgenologist with a keener sense of his responsibility, a greater need for caution, and desire to safeguard the administration of the ray by every means known to us.

THE ACTION OF THE ROENTGEN RAY ON HUMAN BLOOD

Most of our knowledge of the action of the roentgen ray on the blood of humans has been obtained in connection with the roentgen therapy of disease, principally of leukemia and pseudoleukemia. The changes occurring in the blood of roentgenologists after more or less prolonged exposure over a period of years have given us some idea of the "chronic" effects of the ray, though the difficulty with these studies is that it is impossible to separate positively true ray effects from the action of other

environmental influences attending *x*-ray work and possible disease.

v. Jagic, Swartz and v. Siebenrock found the following blood picture in roentgenologists who had no skin lesions and who were apparently in good health:

Leucocytes—slightly diminished (5,300 to 6,000).

Lymphocytes—increased (3,300).

Erythrocytes—slightly elevated in some (5,800,000 to 5,900,000).

Leucocytes (acidophile granula)—constantly diminished.

Aubertin found similar results in eleven roentgenologists without skin lesions:

Leucocytes—generally decreased.

Polymorphonuclears—decreased, sometimes increased.

Mononuclears—markedly increased in three cases.

Eosinophiles—always increased.

Erythrocytes—not changed.

This author states that the increase in the polymorphonuclears is not essential as it only indicates a pause in their destruction.

Wetterer, in his *Handbuch*, refers to Wohler's studies of the blood before and after therapeutic and diagnostic raying. Wohler claims that half an hour after raying there is already a light leucocytosis. The number of leucocytes decrease, however, after repeated raying. Generally speaking, the number of leucocytes remains about normal.

According to Warthin the changes taking place in leukemia due to roentgen treatment are twofold, degenerative and reactive. To the first belong the immediate results which consist of the general degeneration of the leucocytes, both in the blood-forming organs and in the circulating blood itself. This means a decrease in the absolute number of the white cells, and an increase in the degenerative forms. Among the leucocytes the large and small lymphocytes are specially affected, although the polymorphonuclears also degenerate to a certain extent. Warthin did not observe in any case that the blood-forming organs would have returned to normal after the treatment had been suspended. The action of the rays, therefore, amounts only to a temporary degenerative holding back of the activity of the cells during which the original leukemia continues to develop in a somewhat modified, but materially undisturbed form.

Hans Treber studied the blood of ten cancer patients and some cases of myoma before and after treatment by the roentgen ray. The series which had been exposed to the longer raying (daily for four to seven days) had a greater destruction of leucocytes than the series having had a single dose. The erythrocytes were either not changed or only slightly increased.

Murphy, in his experiments of raying immunized mice and rats before inoculating heterologous tissue, grouped the lymphocytes in making his counts, but stated that the changes taking place were almost entirely in the small lymphocytes.

The accompanying blood charts of eighteen cases of cancer under roentgen treatment exhibit the changes which take place after the heavy and moderate doses of roentgen rays, generated through the Coolidge tube at eight inches from target to skin, three millimeters of aluminum filter or equivalent in glass, 7 to 9 MA of current, and 70 to 85 kilovolts.

In all the deep seated cases it has been our practice to cross-fire through 1 1/2 to 2 1/2 or 3-inch circles in as many directions as possible, exposing the tumor and the chains of lymphatics in the neighborhood.

MEASUREMENT OF DOSE

Since the war it has been so difficult to get standard scales for Kienboeck strips that we have not measured our dose as formerly by this method. Indeed, with the Coolidge tube, a modern well equipped transformer, and a few preliminary measurements, it has not seemed so necessary, as quite uniform doses can be given with the ordinary electrical, filter and distance measurements. In our reports we have

TABLE 2

CASE	SEX	AGE	CLINICAL DIAGNOSIS	LABORATORY DIAGNOSIS	METASTASES	DURATION	TREATMENT	APPROX. TOTAL ROENTGEN DOSE	NUMBER OF TREATMENTS	AVERAGE DOSE PER TREATMENT	DATE OF 1ST. TREATMENT	DATE OF LAST TREATMENT	DATE OF 1ST. BLOOD COUNT	DATE OF LAST BLOOD COUNT	NO. OF LYMPHOCYTES 1ST. BLOOD COUNT	NO. OF LYMPHOCYTES LAST B. COUNT	AVERAGE NO. OF LYMPHOCYTES	PRESENT CONDITION OF PATIENT.
1.	F.	50	ADENO-CARCINOMA LEFT BREAST.	—	NONE	6 MOS.	ROENTGEN, ONLY	2760X	12	230X	1/4/16	7/25/16	10/21/16	9/10/16	5760	1825	3978 (8 Counts)	GOOD TUMOR MUCH REDUCED AND SOFT. NIPPLE NOT DRAWN IN AS IT WAS. CLINICALLY WELL
2.	F	50	ADENO CARCINOMA LEFT BREAST	ADENO CARCINOMA	ENLARGED GLANDS BOTH AXILLAE.	LUMP. 4 YRS. OPINION 2 YEARS	5 PRE-OP. ROENT. TREAT. OPERATION — AMP. 5 POST-OP. ROENT. TREAT.	1240X BEFORE OPERATION	5 PRE 5 POST	248X 248X	4/1916	9/1916	4/20/16 Before Op.	6/4/16	1955	3125	2043 (6 Counts)	GOOD. STILL ONE SMALL GLAND IN RT. AXILLA
3.	M.	63	CARCINOMA DESCENDING COLON	CA. DESCENDING COLON NEAR SIGMOID — STENOSIS		7 MOS.	EXPLORATORY OP. ROENTGEN. TREAT.	400 X	2	200	7/18/16	8/22/16	4/27/16	6/27/16	1875	1224	1411 (2 Counts)	SLOWLY SINKING AFTER TEMPORARY IMPROVEMENT AFTER 1ST. ROENTGEN TREAT.
4	F	50	CARCINOMA, MEDIASTINUM BRAIN AND RECURRENT AFTER AMP. BREAST	ENDOTHELIOMA	SCALP, STERNUM, L. AXILLA BRAIN(?)	14 MOS.	AMP. L. BREAST JUNE 1915 2ND. OP. MARCH 1916	440X	2	200	7/6/16	7/12/16	7/6/16	7/12/16	950	2977	1861	DIED 8/20/16
5	F	50	CARCINOMA RECTUM	EPITHELIOMA	NONE	STRICTURE 20 YEARS	BIOPSY FOR LAB. ROENTGEN — ONLY.	2160 X	9	240	2/1/16	5/22/16	7/14/16	9/15/16	3875	2800	3083 (13 Counts)	GOOD GENERAL HEALTH. STOOLS NORMAL. STILL A MORE OR LESS HARD CONSTRICTION.
6	F	40	RECURRENT ROUND CELL SARCOMA LEFT BREAST	ROUND CELLED SARCOMA	GLAND LEFT AXILLA	PRIMARY FOR 1ST. TREAT. 9 MOS.	PRIMARY — AMPOTATION APRIL 1915. RECURRENCE — X-RAY 3 MOS.	1720	8	215	9/24/15	8/10/16	7/27/16	9/15/16	1870	1375	3248 (8 Counts)	ONLY A SMALL REMNANT OF TUMOR LEFT. NO GLANDS. GOOD GENERAL CONDITION.
7	F.	60	ADENO-CARCINOMA LEFT BREAST (ULCERATED)	—	GLANDS LEFT AXILLA	10 MOS.	ROENTGEN, ONLY	1320 X	8	165 X	3/9/16	7/6/16	4/8/16	9/15/16	2880	1554	1870 (10 Counts)	ULCER HEALED. NO TUMOR. SOME SCAR TISSUE. NO ENLARGED GLANDS. CLINICALLY WELL.
8	F	55	CARCINOMA CAECUM	(ROENTGEN) CA. CAECUM	—	SEVERAL WEEKS	ROENTGEN — ONLY	800X	3	266 X	5/26/16	6/23/16	6/8/16	6/23/16	3100	3900	3591 (12 Counts)	DIED 1 MO. LATER. WAS VERY FLESHY.
9	F	39	EPITHELIOMA RT. BREAST	—	NONE	7 OR 8 MOS.	ROENTGEN ONLY	460X	3	153 X	7/3/16	8/10/16	7/3/16	9/8/16	2040	3626	4290 (9 Counts)	IMPROVING.
10	F	53	RECURRENT ADENO CARCINOMA CHEST. NECK. MEDIASTINUM(?)	ADENO CANC. (FROM BREAST-AMP.)	SKIN OF LARGE PART CHEST & NECK AXILLAE. MEDIASTI.	3 YRS +	OPP. RT. BREAST-1913. REMOVED NODULES NECK 1916. POST OP. ROENTGEN	1200X	6	200 X	8/6/16	8/9/16	5/19/16	5/25/16	3105	1358	1646 (5 Counts)	GROWING WORSE. NEW NODULES OLD ONES DID NOT RESPOND
11	F.	65	BASAL-CELLED CARCINOMA OF EYELIDS CHEEK & TEMPLE.	—	NONE	7 YEARS	ROENTGEN, ONLY.	620 X	10	62 X	4/10/16	8/31/16	6/9/16	7/5/16	1820	2295	1948 (9 Counts)	HEALED GOOD HEALTH
12	F	75	ADENO CARCINOMA LEFT BREAST.	—	AXILLAE. SUPRA CLAVICULAR	SINCE 1910	ROENTGEN-ONLY	?	26	200X @ 5½ 195	2/1/16	6/15/16	4/1/16	6/19/16	2100	1650	1495 (14 Counts)	HEALED SINCE 1914. RHEUMATISM & SEVERE KNEE NOW INFANTILE PARALYSIS. SPINAL METASTASIS.
13	F	46	CARCINOMA OF UTERUS	—		SEVERAL MONTHS	PERCY OPERATION. 1 PRE-OP. ROENTGEN. 6 POST-OP. ROENTGEN	X 1940	7	277 X	5/16/16	7/29/16	5/10/16	7/27/16	3910	935	1295 (8 Counts)	GENERAL CONDITION NOT GOOD. PAIN REQUIRING MORPHINE. HAEMORRHAGE SOME IN 2 PLACES
14	F	55	CARCINOMA RT. BREAST	ADENO CA.	AXILLARY GLANDS (RIGHT)	NOV. 1915	PRE-OP R- 4/2/16 OP. 4/25/16 5 POST-OP-R.	1220	1 PRE 5 POST	203	4/20/16	8/24/16	4/24/16	5/16/16	732	2720	1803 (6 Counts)	NO SIGN RECURRENCE. GOOD HEALTH.
15	F.	63	CARCINOMA OF SIGMOID.	—	?		OPERATION 4/22/16 COLOSTOMY PRE- AND POST-OP X	420 X	3	240 X	4/19/16	5/24/16	4/19/16	7/10/16	2452	1176	1815 (28 Counts)	DEAD
16	M	50	COLLOID CARCINOMA OF STOMACH(?) AND OMENTUM	COLLOID CARCINOMA	ABDOMINAL	6 MOS	EXPLORATORY OPERATION — ADD. ROENTGEN RAY.	2160	7	308	5/1/16	8/9/16	5/1/16	8/9/16	3073	910	1953 (6 Counts)	SLOWLY FAILING. MUCH ASCITES.
17	F	67	BASAL-CELLED CARCINOMAS TEMPLE.	—	NONE	15 YEARS	ROENTGEN ONLY.	240 X	17	14 X	11/6/15	8/14/16	6/14/16	9/9/16	6525	900	2384 (6 Counts)	HEALED. GOOD HEALTH.
18	F	36	ADENO CARCINOMA RIGHT BREAST.	LUMP OF SUP. MEDIASTINUM RECURRENCE. ADENO CARCINOMA	AXILLAE. NECK SCAR	3 YRS. ½	2 OPERATIONS — APRIL ROENTGEN — POST OP.	900 X	4	225	JUNE 1916	9/2/16	9/1/16	9/2/16	3135	2080	3139 (12 Counts)	RECURRENCES NOT YET SUBSIDED GENERAL HEALTH GOOD.

thus computed the 20 *x* dose for each of the three machines we use, stating the approximate number of *x*-units given.

The cancer of breast cases were usually treated by "cross-firing" through ten to seventeen or eighteen ports; cancer of uterus through ten or twelve ports.*

THE EFFECT OF REPEATED HEAVY DOSES UPON THE RED BLOOD CELLS OF CANCER PATIENTS

Patient No. 1 (Charts I and Ia) suffered from a non-operated cancer of the breast. Five days after the eleventh treatment we noticed a fall in the red blood corpuscles from 5,250,000 to 3,650,000. Three days after the twelfth treatment they reached 5,400,000, and on the sixth day fell to 2,500,000. On the tenth day they reached 4,000,000, and again on the fourteenth day receded to the low level of 2,600,000. The count then slowly recovered forty-nine days after the twelfth treatment, the patient having received no treatment in the meantime. The patient is clinically in good condition.

Patient No. 5 (Chart V) suffered from a non-operated cancer of the rectum. Blood-counting was begun on the day of the ninth treatment, when 2,000,000 red blood corpuscles were found. Four days later, there were only 2,500,000. A week after the treatment there were 4,400,000. They then vacillated for several weeks (without intervening treatment) between 2,900,000 and 4,400,000, until on the thirty-seventh day they dropped as low as 2,100,000. After the tenth treatment, given the next day (thirty-eighth day of the count), they began to rise in number until three weeks after the tenth treatment (sixtieth day of the count) they reached 4,300,000. Patient is clinically in good condition.

Patient No. 4 (Chart IV), suffering from recurrent endothelioma of the breast, head, etc., showed a drop in the red blood corpuscles from 4,500,000 to 2,900,000 after two treatments six days apart. Patient died about six weeks later.

Patient No. 7 (Chart VII), carcinoma of breast, not operated. The red cells were not counted after the seventh treatment till the sixth day. They were then 4,700,000. Thirteen days after they dropped to 3,500,000. Five days after the eighth treatment they dropped from 4,400,000 to 3,150,000. Patient has made clinical recovery.

Patient No. 8 (Chart VIII), a woman with carcinoma of cecum, exhibited a rise from 4,700,000 to 6,000,000 five days after treatment. In the sixth day a drop occurred to 3,800,000, followed by a rise on the eleventh day to 5,100,000. Patient died about five weeks later.

Patient No. 9 (Chart IX) had an epithelioma of the right breast. Five days after the first treatment the red cells dropped from 5,200,000 to 3,200,000. Twenty-one days after the third treatment they were 2,600,000. The patient is apparently in good condition.

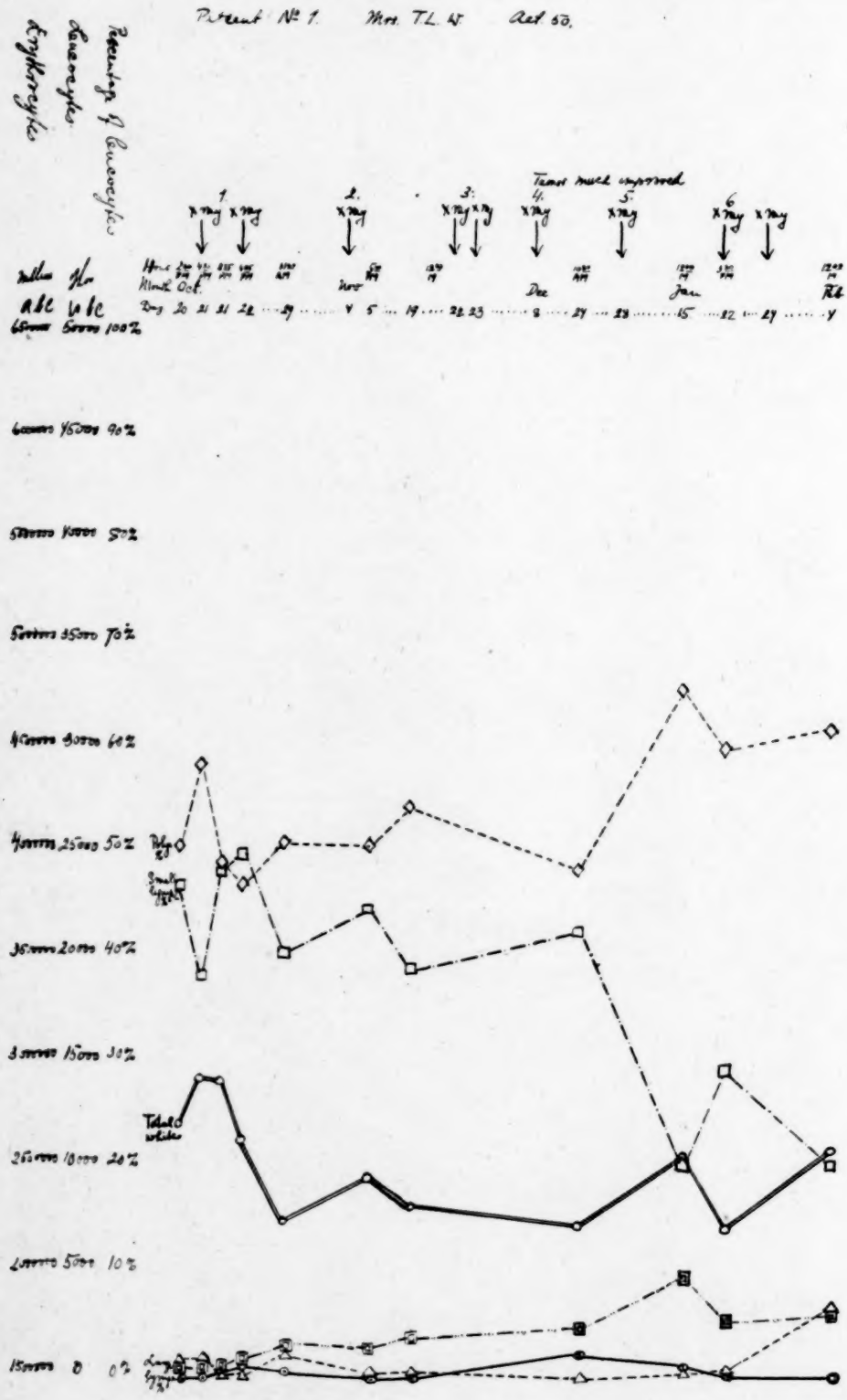
Patient No. 11 (Chart XI), with ulcus rodens of cheek, temple and margins of both eyelids, after a moderate roentgen treatment of 60 *x* through three one-half to one-inch ports had a rise from 4,000,000 to 6,000,000 six days after the fifth treatment. After some vacillations between this high point and 3,700,000 it reached 6,200,000, six days after the sixth treatment.

Patient No. 18 (Chart XVIII), with recurrent cancer of the breast after operation, showed a fall in erythrocytes four days after second treatment, from 3,200,000 to 2,200,000, then a sharp rise to 3,950,000 on the sixth day, and to 4,400,000 on the eleventh day after treatment.

Thus we see that the red corpuscles are profoundly affected by the heavy roentgen treatments, diminishing considerably in number from the fourth to the sixth day, then with vacillations rapidly increasing in number till the tenth or eleventh day,

*This dosage was given at one or two sittings, the latter 24 hours apart. A series of treatments, through several ports of entry in one or two sittings, is referred to as a "treatment" in this article.

CHART I


Patient № 1. Mrs. TL. 45. Age 60.
Percentage of Leucocytes
Leucocytes
Erythrocytes
Tumor much improved
1.
2.
3.
4.
5.
6.
X Ray
Hosp.
Month Oct.
Dec
Jan.
Discharged
Days
Severe 100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Total white

so that there may be a decided erythrocytosis with some vacillations. This may be followed by another drop, and in cases where several treatments have been given over several weeks the figures may not fully recover their former high level before the end of forty or fifty days.

THE EFFECT OF HEAVY DOSES OF ROENTGEN RAY ON THE LYMPHOCYTES IN CANCER PATIENTS

Table 2 gives concisely the main clinical and laboratory features, together with the roentgen dosages of eighteen patients, giving first and last lymphocyte counts and the average of the total number of counts.

TABLE 3

CASE I.—FIRST SERIES OF COUNTS—ADENO-CARCINOMA OF LEFT BREAST—NO OPERATION

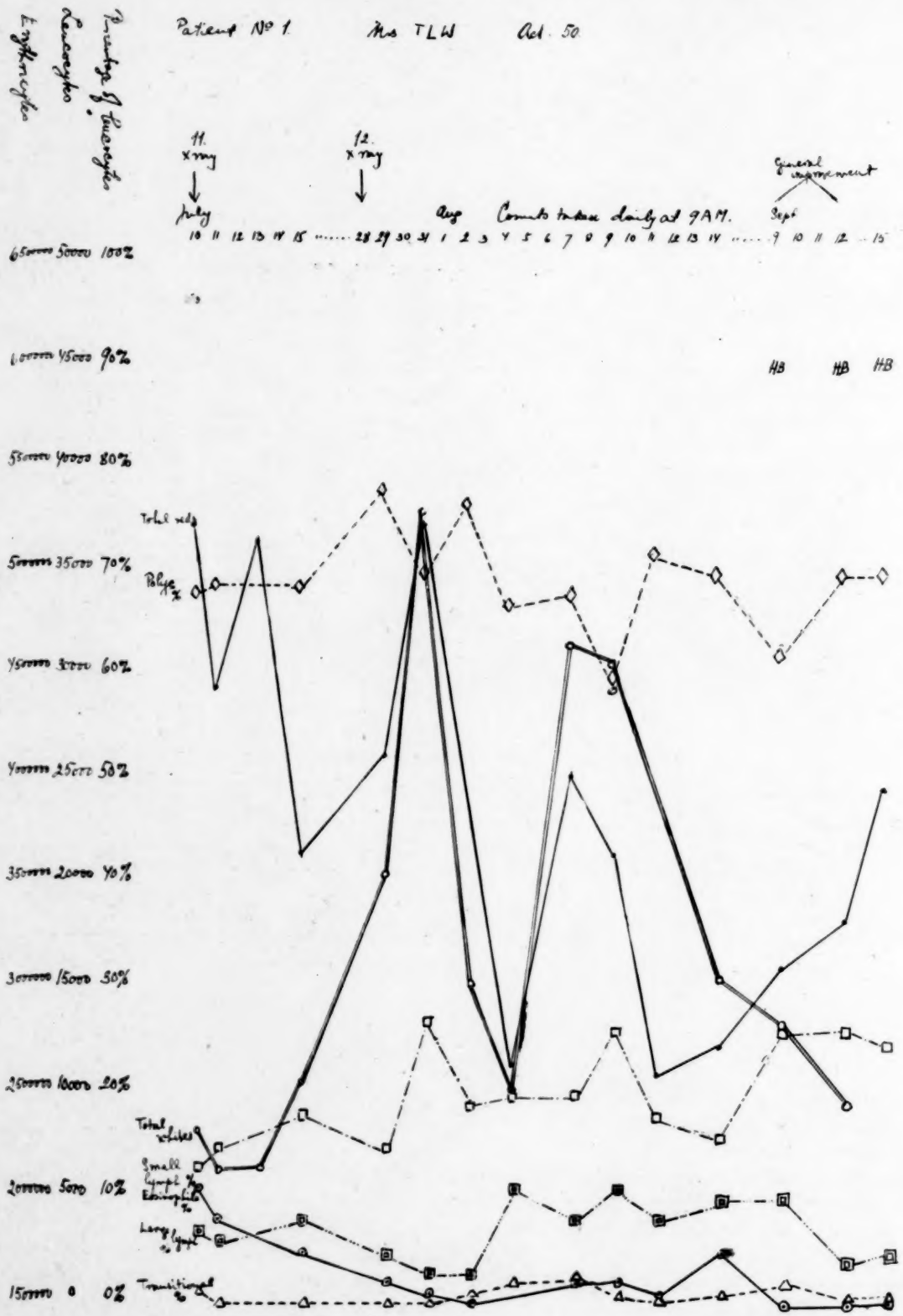
DATE	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH.	TOTAL LYMPH.	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH.	% LARGE LYMPH.	% TOTAL LYMPH.
1915 10-21 2 PM		12,000	6000	5760	5640	120	47	1	48
3.30 PM 4 PM	1(a)	13000	7670	5070	4940	130	38	1	39
8 PM 10-23 3.30 PM	1(b)	13000	6370	6630	6500	130	50	1	51
4 PM		11500	5305	6095	5865	230	51	2	53
10-24 11 AM		7500	4825	3125	2900	225	40	3	43
11-4	2								
11-3 5 PM		9500	4845	4370	4085	285	43	3	46
11-19 12 NOON		8000	4400	3440	3120	320	39	4	43
11-22	3								
11-23	3								
12-8	4								
12-24 10 AM		7500	3675	3600	3225	375	43	5	48
12-28	5								
1916 1-15 12 NOON		10000	6600	3200	2200	1000	22	10	32
1-22 3 PM	6	7500	4575	2700	2250	450	30	6	36
1-24	6								
2-4 12 NOON		11000	6930	286	2090	770	19	7	26

Apparently, this disturbance in the erythrocytes is not necessarily accompanied by any ill health.

It will thus be seen that the statement made by many experimenters with reference to lower animals to the effect that the erythrocyte count is unaffected, does not hold good for cancerous humans under massive deep roentgen treatment.

The lymphocytes are grouped together. Cases 1, 4, 5 and 9 have average counts of over 3,000. They are all in favorable condition at present, with growths retrogressing or retrogressed, and general health good. Case 18 has a similar average. This

CHART Ia


Patient No 1. Mrs TLW Act. 50
Percentage of Lymphocytes
Percentage of Leucocytes
Erythrocytes
11. X ray
12. X ray
July
Aug
Counts taken daily at 9 A.M.
Sept
General improvement
10 11 12 13 14 15 ..... 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 ..... 9 10 11 12 15
HB HB HB
Total reds
Polys %
Total whites
Small lymph %
Eosinophils %
Large lymph %
Transitionals %

patient, however, has mestastases in the scar, axillary and cervical glands, which appeared after only two treatments following operation last June. She had no further treatment until September. Some of the other patients, with averages of 1,800 to 2,500 (normal), have also done well, but some, also with normal averages, have died or are moribund. Those with averages below normal are dead or moribund.

slight absolute decrease in the small and an increase of the large lymphocytes immediately after the first roentgen treatment (about 140 *x*) and four hours later the small were increased. The day following, she had 140 *x* more, through other ports and immediately after this there was still a lymphocytosis of the small lymphocytes, and a further increase of the large. On the ninth day, the small lymphocytes

TABLE 4

CASE NO. 1.—SECOND SERIES OF COUNTS—ADENO-CARCINOMA OF LEFT BREAST

DATE 1916	NO. OF COURSE OF TREAT.	TOTAL WHITE	POLY-MORPH	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
7-10	11	8500	5620	1700	1105	595	13	7	20
7-11		6500	4485	1365	975	390	15	6	21
7-15		6500	4485	1690	1170	520	18	8	26
7-28	12								
7-29		10500	8190	1995	1470	525	14	5	19
7-31		20500	14350	5948	5330	615	26	3	29
8-2		38000	29260	9360	8220	1140	19	3	22
8-4		15000	10350	4500	3150	1350	21	9	30
8-7		10000	6800	2800	2200	600	22	6	28
8-9		30500	18300	10980	8235	2745	27	9	36
8-11		29500	21830	7670	5900	1770	20	6	26
8-14		15500	11160	4030	2790	1240	18	8	26
9-9		13500	8370	4840	3760	1080	28	8	36
9-12		9500	5890	2880	2470	380	26	4	30
9-15		9500	6840	2850	2375	475	25	5	30

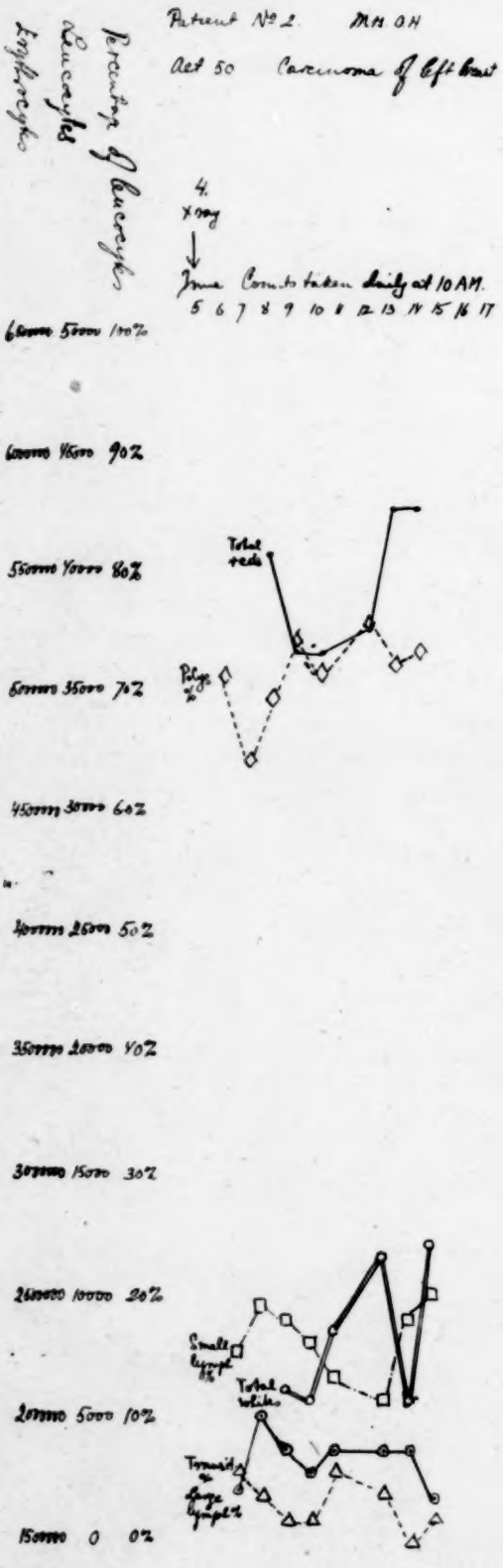
It would appear from this series, then, that an average lymphocytosis of over 3,000 might be a favorable indication, but an average lymphocyte count below the normal might be unfavorable.

The study of the differential lymphocyte count, however, from day to day reveals information that gives promise of much value to the roentgen therapeutist.

Patient No. 1, Chart I, Table 3, with carcinoma of the left breast, showed a

were about half what they were the second day, but the large remained about the same. On the fourteenth day, there was considerable regeneration of the small and a further increase of the large. The large lymphocytes continued to increase with roentgen treatments every fourteen days, until, on the eighty-fifth day, they numbered eight times what they were before treatment. They were still six times their original number on the one hundred and fifth day, while the small lymphocytes

CHART II



showed a constant decrease from 5,640 at the beginning to 2,090.

In this series the small lymphocytes appear to have been suppressed or degenerated, while the reaction called forth in the lymphoid organs resulted in a lymphocytosis of the large cells. There was a leucocytosis of 12,000 to begin with. This was slightly increased the next two days as were also the polymorphonuclear cells, but decreased after that throughout the series.

Table 4, Chart Ia, in this same patient was made over five months later, the patient having received eight treatments in the preceding nine months. Here we find a decrease in both large and small lymphocytes the day after the ninth roentgen treatment. On the sixth day after the treatment we note a slight reaction with a small increase of both large and small. This increase was still apparent on the nineteenth day of the treatment. At this time a second dose was given. Two days later there was a marked lymphocytosis principally of the small cells. On the fourth day this increase was almost 500 per cent. in the small, and 100 per cent. in the large lymphocytes. Here is a marked reaction. On the sixth day the large cells are still further increased while the small have diminished. On the ninth day there is a marked decrease of both, but on the eleventh day a second reaction seems to take place, with the large lymphocytes increased by about 400 per cent. and the small by 500 per cent. This lymphocytosis is still considerable until the forty-second day, after which there is a drop to about normal. There was a slight decrease of leucocytes and polymorphonuclears on the second and sixth days, but a general polymorpholeucocytosis on the ninth day.

Thus we see a total lymphocytosis beginning on the second day, reaching its climax about the sixth to eleventh day and continuing (without the intervention of further treatment) until the forty-second day. We also note that the increase of large lymphocytes constantly lags behind

the increase of small lymphocytes by about a day. This patient had in the beginning of her treatment (first series) a small lymphocytosis over 100 per cent. higher than at the end of the second series of counts, but the large lymphocytes have increased by 300 per cent. She is clinically in good condition. A marked increase of leucocytes and polymorphonuclears accompanied the increase of lymphocytes. The polymorphonuclears showed but little change relatively, but the total count rose and fell with the lymphocyte count.

Patient 2, Chart II, Table 5. Woman, aged 50, adeno-carcinoma of the left breast. Referred by Dr. H. A. Shafor.

In this chart we have no blood record until the third day after the fourth treatment (four pre-operative treatments two weeks apart). On the sixth day, there is an increase of large and small lymphocytes, the former 100 per cent. The increase continued through to the tenth day after treatment, when the record ceases.

Note in this case the reaction on the sixth day continuing at least four days. This patient had enlarged axillary glands in both sides. She had her operation a week after the fourth treatment. The patient is in fairly good condition, though the gland in the right axilla, which was not removed at the time of the operation, has not yet retrogressed under the influence of the ray.

Patient No. 5, Chart V, Table 6, with epithelioma of rectum two inches above the anus, was a woman aged 50, referred by Dr. E. C. Hoff.

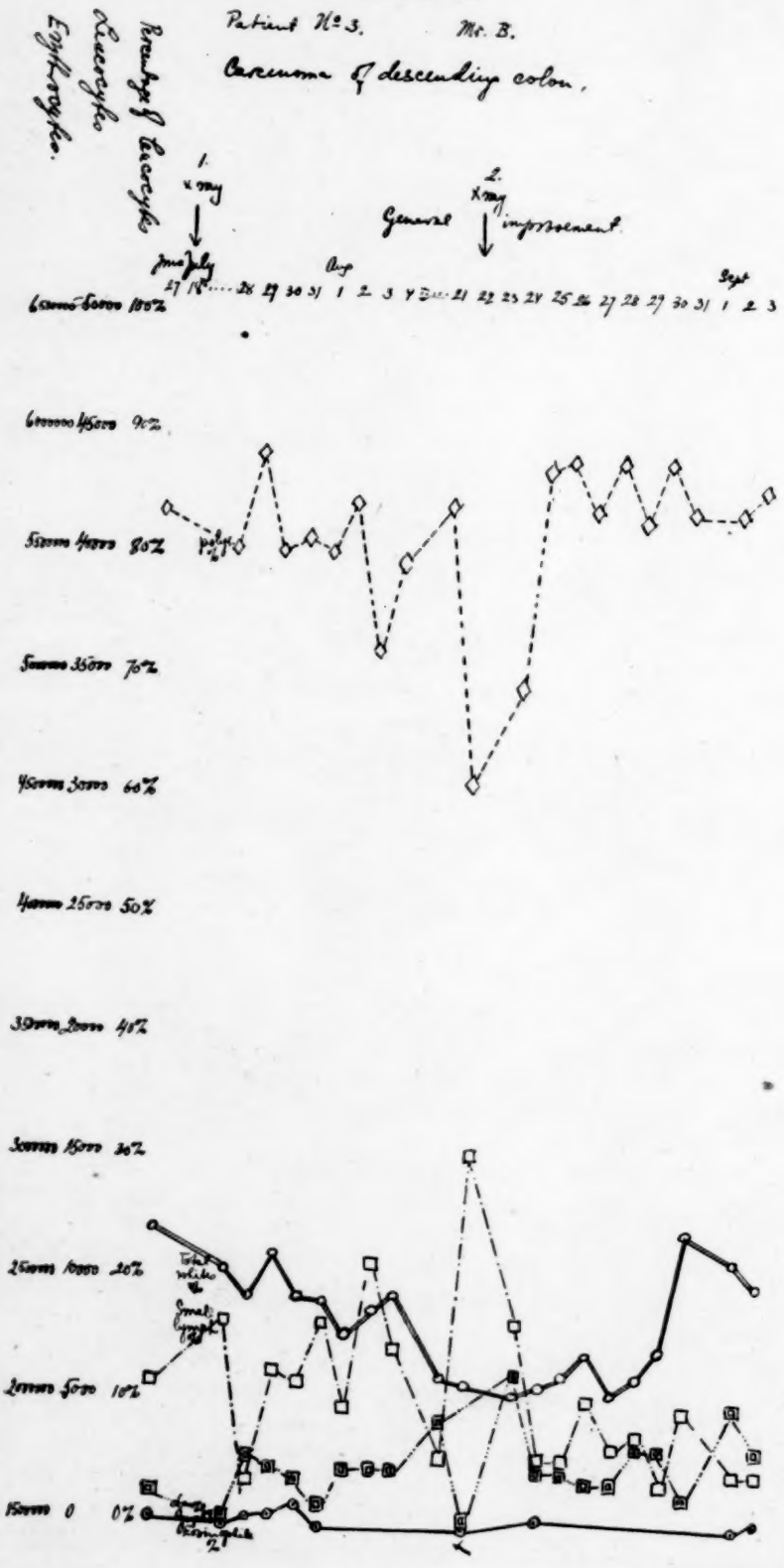
The first blood examination was made just previous to her ninth treatment. On this day she had a lymphocytosis, both large and small. On the following day we note a marked decrease in the large lymphocytes, and a very slight increase in the small. On the sixth day there is no response as in the previous cases. On the eighth day, there is a fall to about normal. On the ninth day, the large are increased to their first day number and the small about the same number also. Then the small increase almost by 100 per cent. from the fourteenth to the twenty-second day, while the large dropped considerably. On the twenty-second day (blood not taken between fifteenth and twenty-second), there begins a decided reaction in both large and small, reaching the climax on the twenty-seventh day, when the large have increased by about 300 per cent. and the small by about 200 per cent. over the number on the first day. Their number then slowly drops to about normal on the thirty-seventh day. There was no further roentgen treatment until the forti-

TABLE 5

CASE NO. 2.—ADENO-CARCINOMA OF LEFT BREAST

DATE 1916	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH	TOTAL LYMPH.	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
6-5	1								
6-8		6500	4550	1755	1355	400	19	8	27
6-9		6000	4500	1380	1020	360	17	6	23
6-10		9000	6480	1980	1260	720	14	8	22
6-12		12000	9120	2400	1440	960	12	8	20
6-13		6000	4380	1620	1140	480	19	8	27
6-14		12500	9250	3125	2625	500	21	4	25

CHART III


Patient No 3. Mr. B.
Carcinoma of descending colon.
Breakup of Leucocytes
Leucocytes
Erythrocytes.
1. X ray
2. X ray
General improvement
June July Aug Sept
27 28 29 30 31 1 2 3 21 22 23 24 25 26 27 28 29 30 31 1 2 3
6 000 000 100%
6 000 000 90%
5 500 000 80%
5 000 000 70%
4 500 000 60%
4 000 000 50%
3 500 000 40%
3 000 000 30%
2 500 000 20%
2 000 000 10%
1 500 000 0 0%
Total white
Small lymph.
Polynucl.
Eosinophil.
27

eth day. On the twenty-second day when the greatly increased lymphocytosis begins, the number of polymorphonuclears falls and reaches the lowest level, as the lymphocytes reach the high level.

In this case, then, there is no reaction until the ninth day. It mildly continues with a slight fluctuation until the twenty-second day and then begins in earnest, continuing till the thirty-seventh and reaching the climax on the twenty-ninth day. The reaction in the large lymphocytes does not lag behind that of the small as in previous cases, but appears to be coincident with it. This patient has no more small ribbon-like stools as at first, she appears perfectly well, but there is still a hard scar-like band in the rectum. A physician found a stricture in the rectum twenty years ago and she had a fistula in ano at age of sixteen, so the probability is there has been scar tissue in the rectum for many years. She is very large and fleshy. The treatment was given by cross-firing through the anal and vaginal regions, sacrum and lower abdomen. Previous to treatment, the rectum was dilated by her surgeon, Dr. E. C. Hoff, and a section taken for microscopical examination by Dr. Carl Meloy who reported epithelioma.

Patient No. 6, Chart VI, Table 7.—Woman, aged 40, had a recurrent sarcoma of the breast one year after operation. Tumor about the size of a hen's egg, near left axilla. Referred by Dr. Chas. Kennedy.

Blood count began just previous to seventh treatment, there having been six former treatments about two weeks apart.

In this table we first note a normal total lymphocyte count. The patient was quite nauseated and nervous after the treatment, but the other treatments had the same effect on her, though to a less extent. On the day following the treatment the differential and total lymphocyte count had dropped, the latter considerably below normal. On the third day there was an

CHART IV

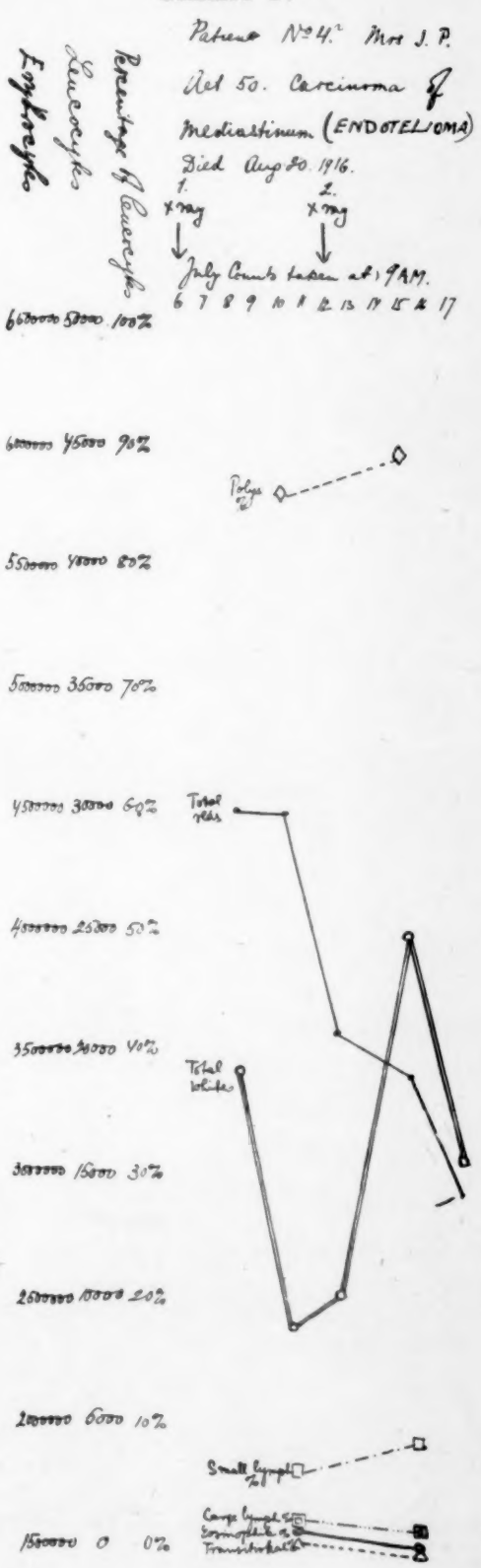
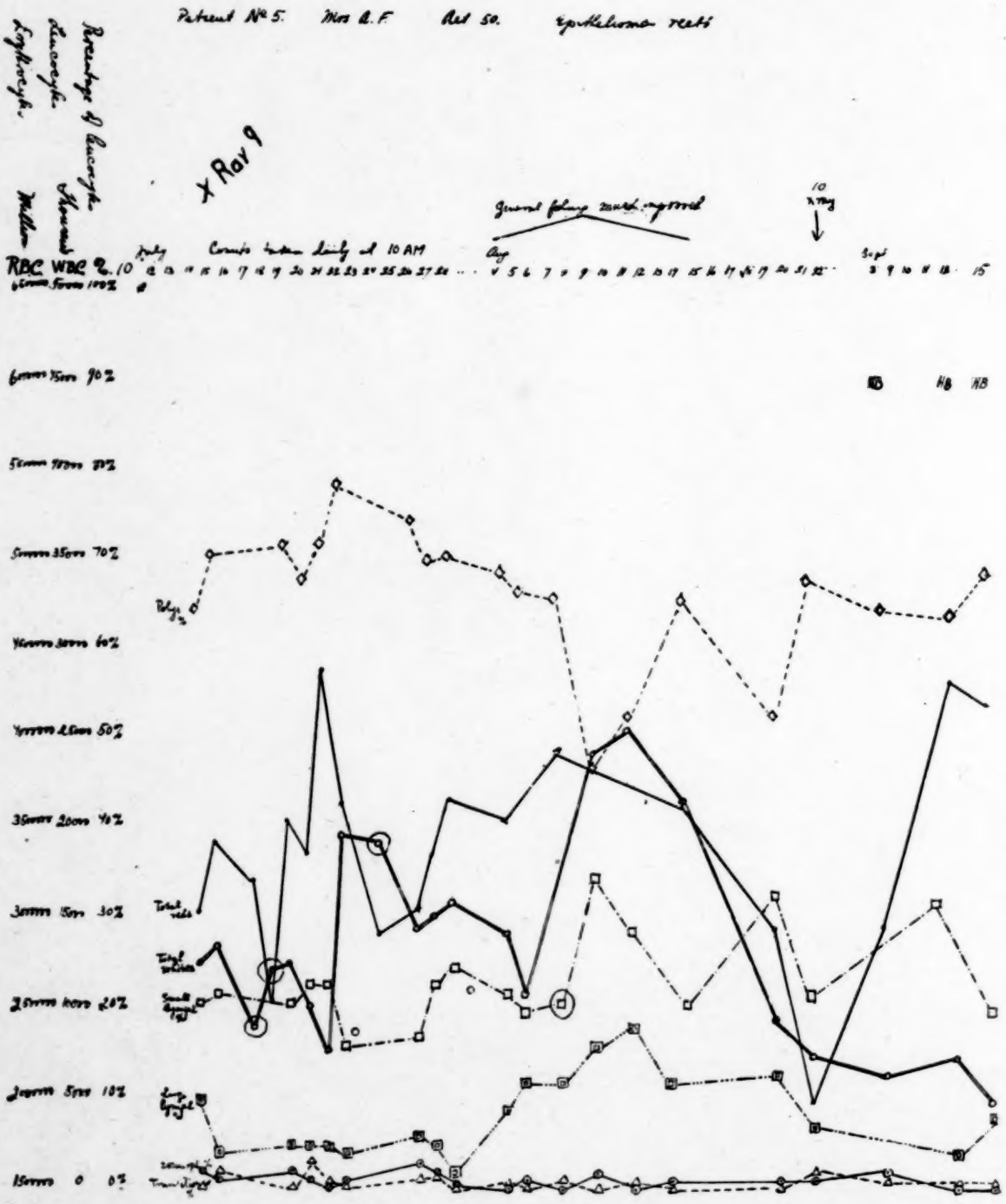


CHART V


Patient No 5. Mrs B.F. Age 50. Epithelioma recti
Percentage of lymphocytes
Percentage of leucocytes
Leucocytes
Millions
RBC WBC
X Ray 9
General feeling much improved
10 X Ray
July
August
Sept
Counts taken daily at 10 AM
90%
70%
60%
50%
40%
30%
20%
10%
0%
HB HB HB

enormous increase in the cells of both sizes, the large increasing by about 200, and the small by about 300 per cent. This was followed by some falling off of both counts until the seventh day. This reaction reached the climax about the twelfth day (no count having been taken between the twelfth and fifteenth days). The count of large and small was still above normal on the fifteenth day, when the eighth treatment was given. The patient was very sick for four or five days after the last treatment and could not come to have the blood taken, being extremely nauseated. Before she arrived home an enormous urticarial swelling as large as an egg developed below the left mastoid and persisted for about twenty-four hours. General urticaria followed, lasting five or six days. She was exceedingly nervous and could not sleep well for two or three days after treatment. She was still somewhat nauseated eleven days after the treatment. The tumor at this time was reduced three-fourths in size.

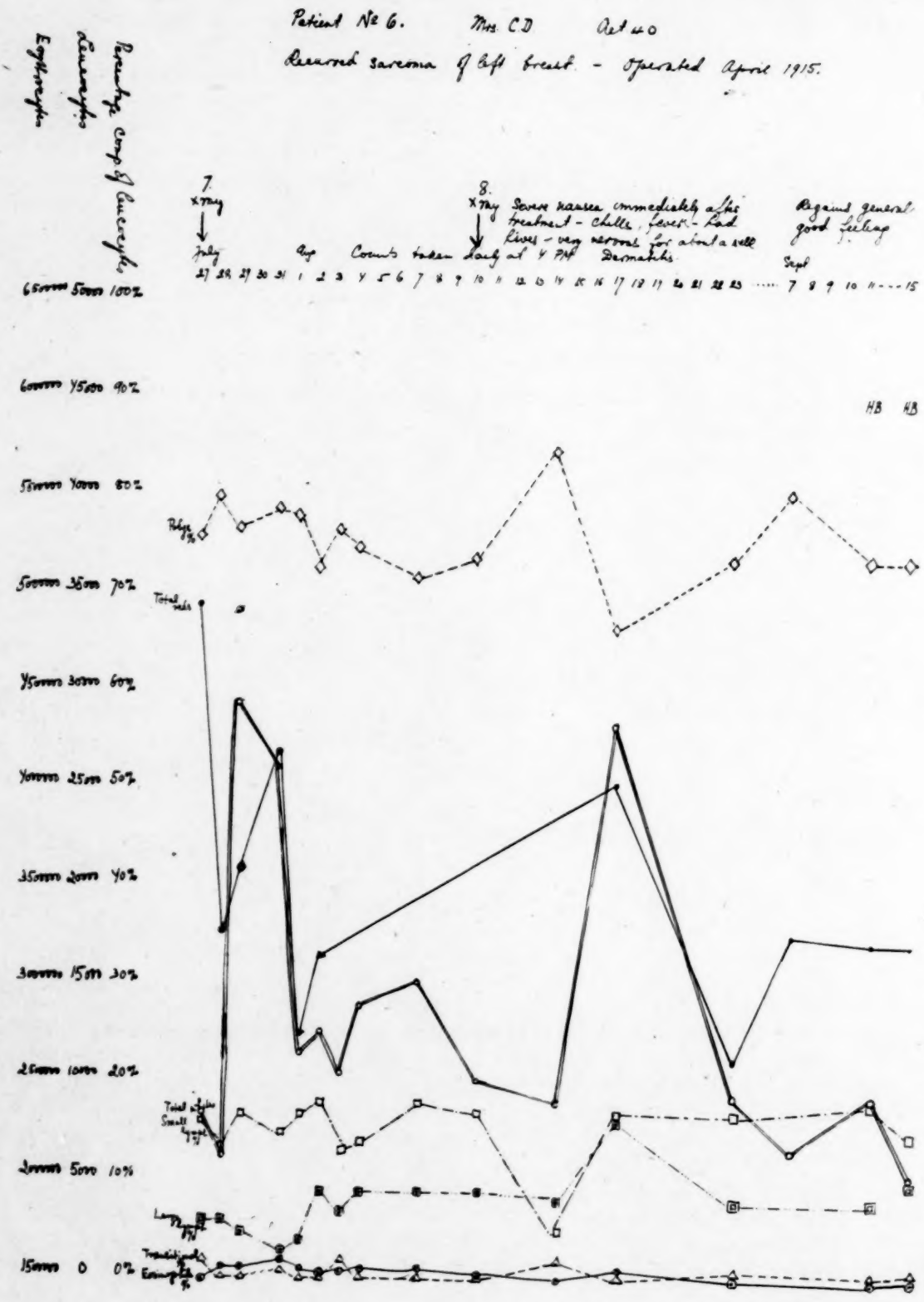
On the fifteenth day she was given her eighth treatment, consisting of about 160 *x* through eight ports to left side. Four days

TABLE 6

CASE NO. 5.—EPITHELIOMA OF THE RECTUM

DATE 1916	No. of Course of Treat.	Total White	Poly-morph	Total Lymph.	Total Small	Total Large	% Small Lymph.	% Large Lymph.	% Total Lymph.
7-13	9								
7-14		12500	8125	3875	2625	1250	21	10	31
7-15		13500	9450	3510	2970	540	22	4	26
7-19		12500	9000	3250	2625	625	21	5	26
7-20		11500	7820	3220	2645	575	23	5	28
7-21		7800	5616	2184	1794	390	23	5	28
7-22		19500	15435	3900	2620	1280	16	4	20
7-26		14500	10875	3335	2465	870	17	6	23
7-27		15200	10640	4256	3496	760	23	5	28
7-28		16000	11360	4320	4000	320	25	2	27
8-4		14200	9798	4402	3124	1278	22	9	31
5		11000	7370	3520	2200	1320	20	12	32
9		24500	10005	12495	8575	3920	35	16	51
11		25500	13515	11985	7395	4590	29	18	47
14		21500	14190	7095	4515	2580	21	12	33
19		9500	5035	4370	3135	1235	33	13	46
21		7500	5250	2175	1650	525	22	7	29
22	10								
9-11		7500	4875	2700	2400	300	32	4	36
15		10000	7000	2800	2000	800	20	8	28

CHART VI


Patient № 6. Mrs. C.D. Act 40
Recurred sarcoma of left breast - Operated April 1915.
Percentage comp. of Leucocytes
Lymphocytes
Eosinophiles
7. X-Ray
8. X-Ray
Severe nausea immediately after treatment - Chills, fever - Had Diarrhea - very normal for about a week
Regained general good feeling
July
Aug
Sept
Counts taken daily at 4 PM
HB HB
Polys %
Total cells
Total white
Small lymph %
Large Mn %
Transitionals %
Eosinophils %

later her large lymphocytes numbered 720 and the small only 450, or a total of 1,170, which is considerably below normal. Her total white count was 8,000, and the percentage of polymorphonuclears was 85.

On the seventh day there was a strong reaction in the lymphocytes with an increase of about 400 per cent. in both large and small. The total white count about this time was 28,500 and percentage of polymorphonuclears, 67. In another week when the next blood count was taken, the large lymphocytes were still somewhat increased while the small were considerably diminished, the total being about normal. On the twentieth day the total count was below normal, due to great decrease of small lymphocytes.

Thus, this case exhibited a strong lymphoid reaction on the third and fourth days after treatment following a marked depression on the second day. On the seventh day the second more lasting reaction occurred, reaching its climax on the twelfth day.

Patient No. 7, Chart VII, Table 8.—Woman, aged 60, with carcinoma of the left breast, ulcerated. No operation. Referred by Dr. G. G. Caron.

The lymphocyte count was begun the seventh day after the seventh roentgen treatment. On that day, the large lymphocytes numbered 1,080, and the small 1,800: evidently a reaction which continued to the tenth day. On the twelfth and thirteenth days there was a decreased count of both large and small, which again increased on the fourteenth. The further counts have been too irregular and infrequent to be suitable for comparison.

The polymorphonuclears on the seventh day were 67 per cent., gradually rising to 86 per cent. on the twenty-second.

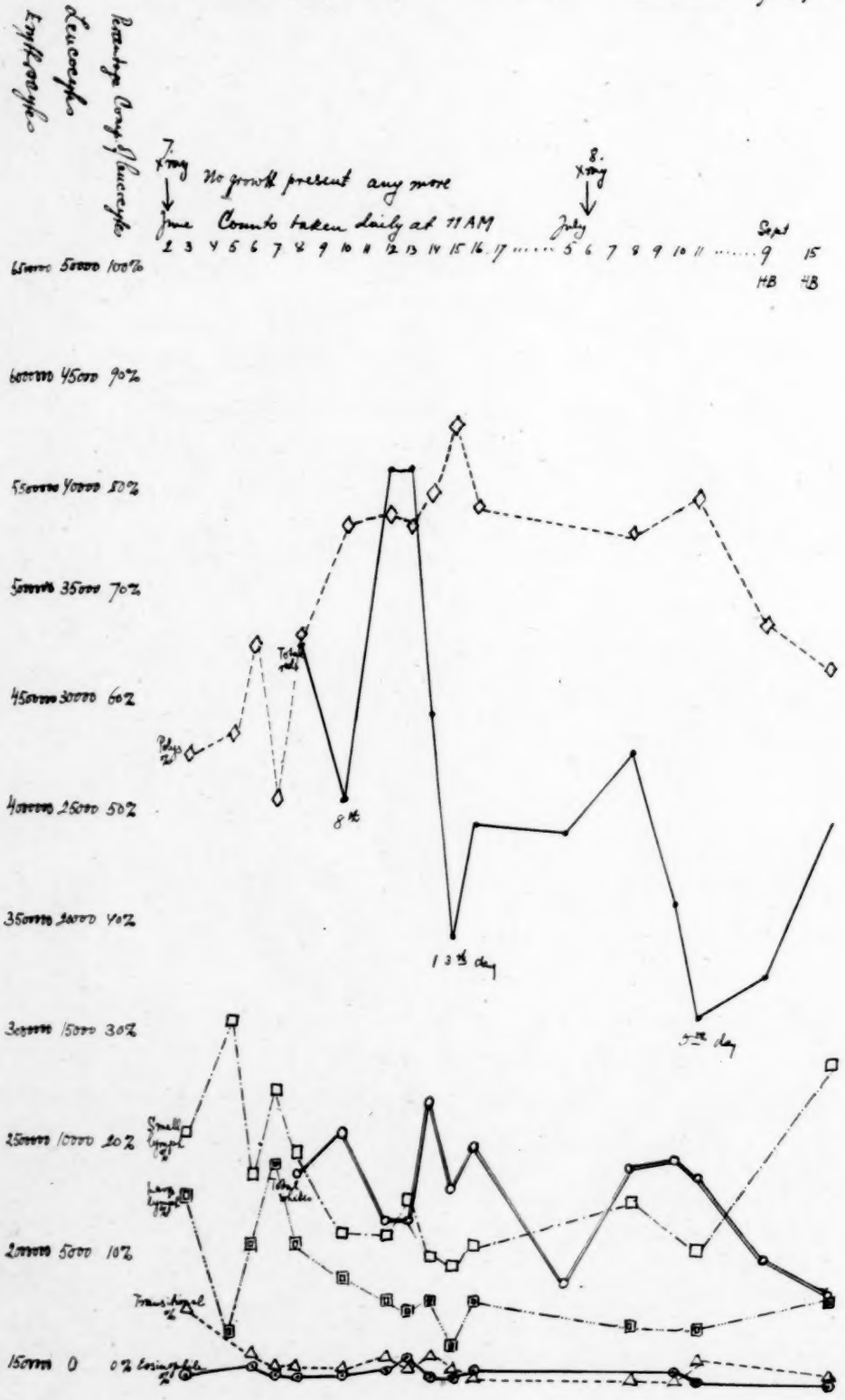
TABLE 7

CASE NO. 6.—RECURRENT SARCOMA OF LEFT BREAST

DATE	NO OF COURSE OF TREAT.	TOTAL WHITE	POLY-MORPH.	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
7-27	7	8500	6460	1890	1360	510	16	6	22
7-28		6200	4960	1240	868	372	14	6	20
7-29		29500	22715	6490	5015	1495	17	5	22
7-31		26200	20698	4716	3930	786	15	3	18
8-1		11600	9048	2436	1982	454	17	4	21
8-2		12500	9125	3375	2250	1125	18	9	27
8-3		10500	8085	2100	1365	735	13	7	20
8-4		14000	10500	3220	1960	1260	14	9	23
8-7		15000	10800	4050	2700	1350	18	9	27
8-10	8	10000	7400	2600	1700	900	17	9	26
8-14		9000	7650	1170	450	720	5	8	13
8-17		28500	19095	9405	8845	4560	17	16	33
8-23		9200	6808	2395	1656	736	18	8	26
9-11		5500	4070	1375	935	440	17	8	25

CHART VII

Patient No 7. Mrs C.A. Aet 60. Carcinoma of left breast



This case shows lymphoid reactions on the seventh and fourteenth days after a dose of 120 *x*, this being the seventh treatment. The tumor at the time of this treatment had entirely disappeared, the ulcer having healed after the second dose. She is clinically cured to-day.

Patient No. 9, Chart IX, Table 10.—Woman aged 39, with epithelioma of the right breast.

ones. The patient was a very fleshy woman and the growth at present is nearly healed after three treatments.

Patient No. 11, Chart XI, Table 12.—Woman, aged 65, with rodent ulcers involving temple, cheek and both eyelids.

The count began on the day of the fifth treatment, she having had treatments about two weeks apart. Dose of fifth

TABLE 8

CASE NO. 7.—ADENO-CARCINOMA OF LEFT BREAST (NO OPERATION)

DATE	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
6-2	7								
6-8		9000	6030	2880	1800	1080	20	12	32
6-10		11000	8470	2420	1430	990	13	9	22
6-12		7000	5460	1400	910	490	13	7	20
6-13		7000	5390	1540	920	420	16	6	22
6-14		12500	10000	2250	1375	875	11	7	18
6-15		8500	7310	1105	850	255	10	3	13
6-16		10500	8295	1995	1260	735	12	7	19
7-6	8								
7-8		9500	7315	1995	1520	475	16	5	21
7-11		9200	7360	1564	1104	460	12	5	17
9-15		4200	2330	1554	1218	336	29	8	37

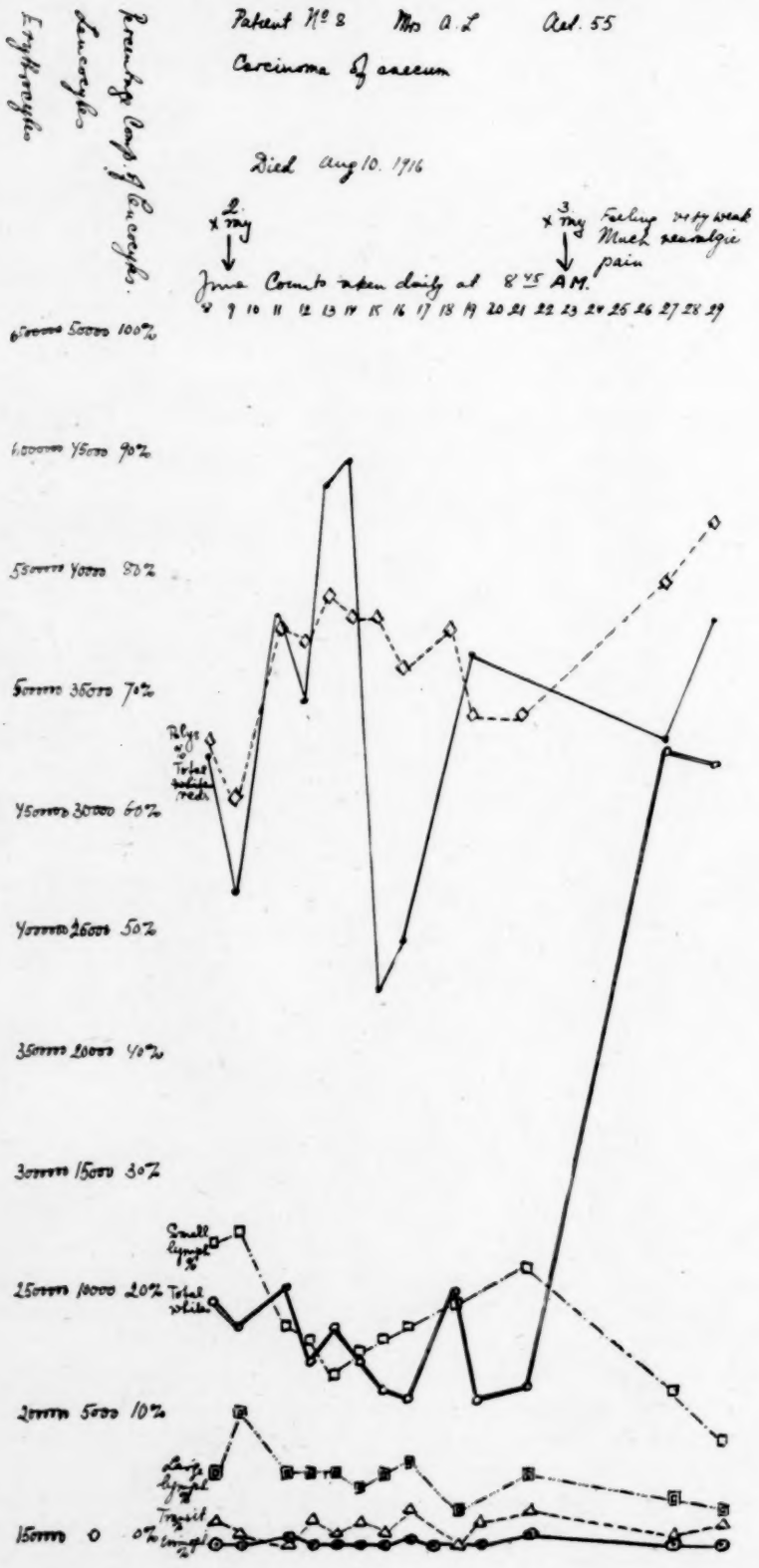
The blood count began the day of the first treatment. There was no marked reaction until the seventh day when the small lymphocytes increased by 300 and the large by over 200 per cent. The reaction continued through to the fourteenth day, when the count ended. On the thirteenth day there was a second strong reaction, being the climax of the large lymphocytes. During the rise of the lymphocytes, the percentage of polymorphonuclears fell.

This case, which had received a dose of 240 *x*, reacted similarly to the previous treatment about 80 *x* to 4 ports. A slight reaction appeared four days after.

Four days after the sixth treatment (sixteen days after the fifth) a strong but short-lived reaction took place in the large lymphocytes, which were increased by about 100 per cent. The small were not influenced.

The areas exposed in this case were very small as compared to the breast and intestinal cases, which no doubt may account for the slight lymphocytic reaction. The ulcers were nearly healed at the time of the fifth treatment and relapsed slightly

CHART VIII


Patient № 8 Mrs A. L Aet. 55
Carcinoma of caecum
Died Aug 10. 1916
2 mg
3 mg
Feeling very weak
Much neuralgic pain
Urine Counts taken daily at 8 45 AM.
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
Red cells Comp. of Leucocytes.
Leucocytes
Erythrocytes
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Polys & Total white cells
Small lymph %
Total white
Large lymph %
Transit %
Eosinophil %

at the time of the sixth treatment. All ulcers are now healed since the tenth treatment.

These are some of the cases that have reacted to the treatment favorably. The following are unfavorable cases:

Patient No. 8, Chart VIII, Table 9.—Woman very fleshy, aged 55. Carcinoma of cecum—not operated. Referred by Dr. Geo. McKean.

The first blood count was made the day of the second treatment, when 280 *x* were given through the abdomen, front and back. About the same dose had been given two weeks before. There was some diminution of small lymphocytes beginning the day following the treatment. For the second and third days the large were slightly increased, then decreased to the fourteenth day. On the sixteenth day a third treatment of about the same size was given. There was a marked reaction on the fourth day (no counts previous to the fourth day following this treatment). It was still present on the sixth day, when the last count was made. The patient died about a month later. The percentage of polymorphonuclears went to 85 per cent. on the day of the last count. The percentage was above 76 from the second day of the treatment. This case differs from the preceding where heavy doses were used by showing a lowering of the lymphoid index for fourteen days. After the third dose there was a strong reaction from the fourth to the sixth day similar to favorable cases, but the patient did not improve. Unfortunately we could not watch the count through fourteen days longer, to see if the reaction was at all lasting.

TABLE 9

CASE NO. 8.—CARCINOMA OF THE CAECUM

DATE	NO OF COURSE OF TREAT	TOTAL WHITE	POLYS	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
1912 6-8		10000	6700	3100	2500	600	25	6	31
6-9	2	9000	5580	2970	1980	990	26	11	37
6-11		10500	7980	2520	1890	630	18	6	24
6 12		7500	5625	1725	1275	450	17	6	23
6 13		9000	7110	1800	1260	540	14	6	20
6-14		7500	5775	1575	1200	375	16	5	21
6-15		6500	5005	1495	1105	390	17	6	23
6-16		6000	4350	2160	1740	420	19	7	26
6-18		10500	7980	2415	2100	315	20	3	23
6 21		6500	4485	1582	1192	390	23	6	29
6-23	3								
6-27		33000	26400	5610	4290	1320	13	4	17
6-29		32500	27625	3900	2925	975	9	3	12

Patient No. 10, Chart X, Table 11, referred by Dr. Chas. Kennedy. Aet. 53, recurrent adeno-carcinoma, metastases. Operated three years before. Second operation three days before treatment.

There was no lymphocyte reaction in seven days, the counts being below normal.

This case developed numerous metastases in the skin of the chest and glands

CHART IX

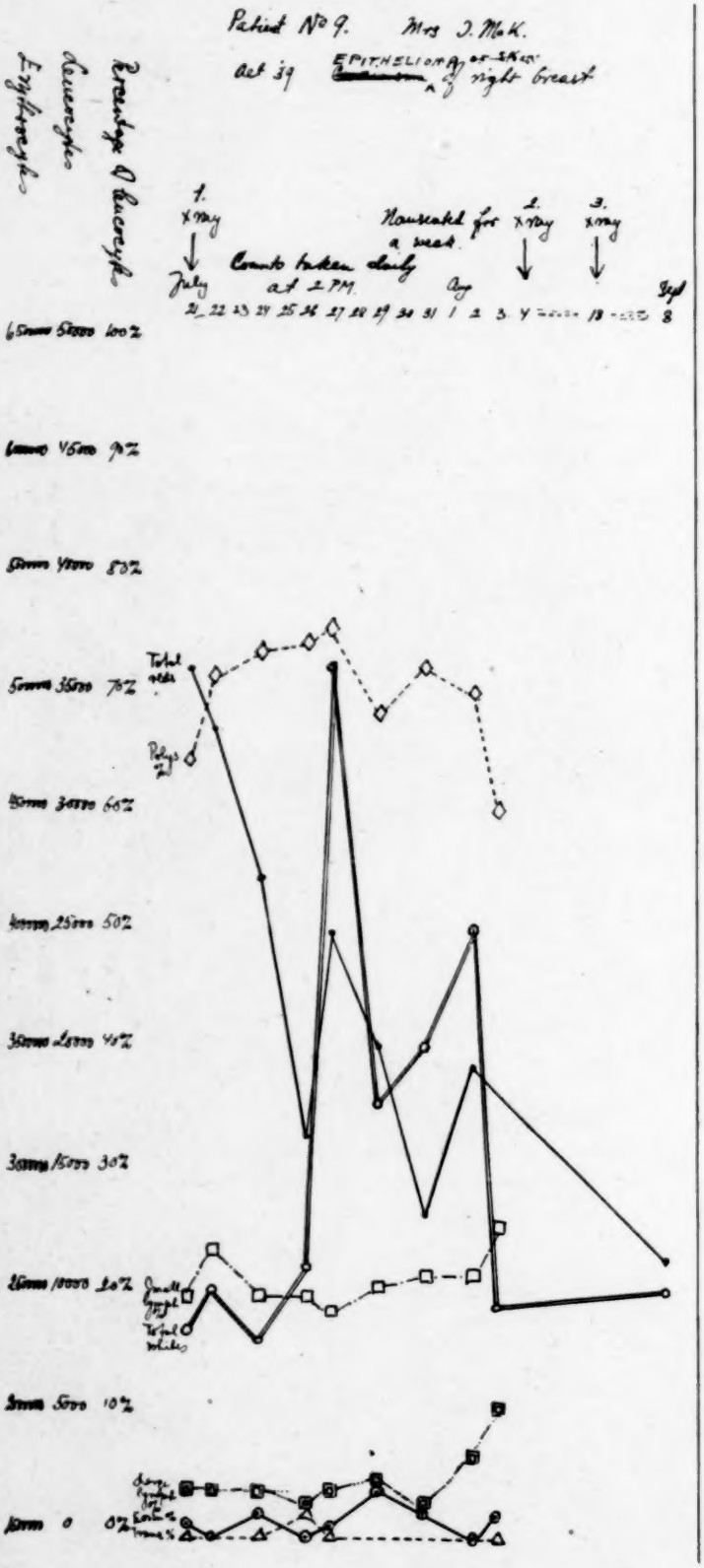


CHART X

TABLE 10

CASE NO. 9.—EPITHELIOMA OF RIGHT BREAST (NO OPERATION)

DATE	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
7-21	1	8500	5525	2040	1620	420	20	4	24
7-22		10000	7200	2800	2400	400	24	4	28
7-24		8200	6068	1968	1640	328	20	4	24
7-26		11200	8400	2576	2240	336	20	3	23
7-27		36500	27740	8445	6985	1460	19	4	23
7-29		18000	12420	4680	3780	900	21	5	26
7-31		20500	14965	5125	4510	615	22	3	25
8-2		25400	18034	7366	5588	1178	22	7	29
8-3		9800	5978	3626	2548	1078	26	11	37
8-4	2								
8-18	3								

soon after operation, and they would not respond to treatment.

Patient No. 13, Chart XIII, referred by Dr. L. Hartman. Carcinoma of uterus, metastases, operation three days after first treatment.

This table exhibits no marked reaction after five treatments. She has not had more than temporary relief from the treatment and is moribund.

Patient No. 15, Chart XV, woman aged 65. Carcinoma of sigmoid. Referred by Dr. Hewitt. Operation colostomy.

Blood count began six days before first roentgen treatment. Operation four days later. Her lymphocytes averaged high before the treatment. The counts were rather irregular, and showed no lymphocytosis seven days after the first treatment.

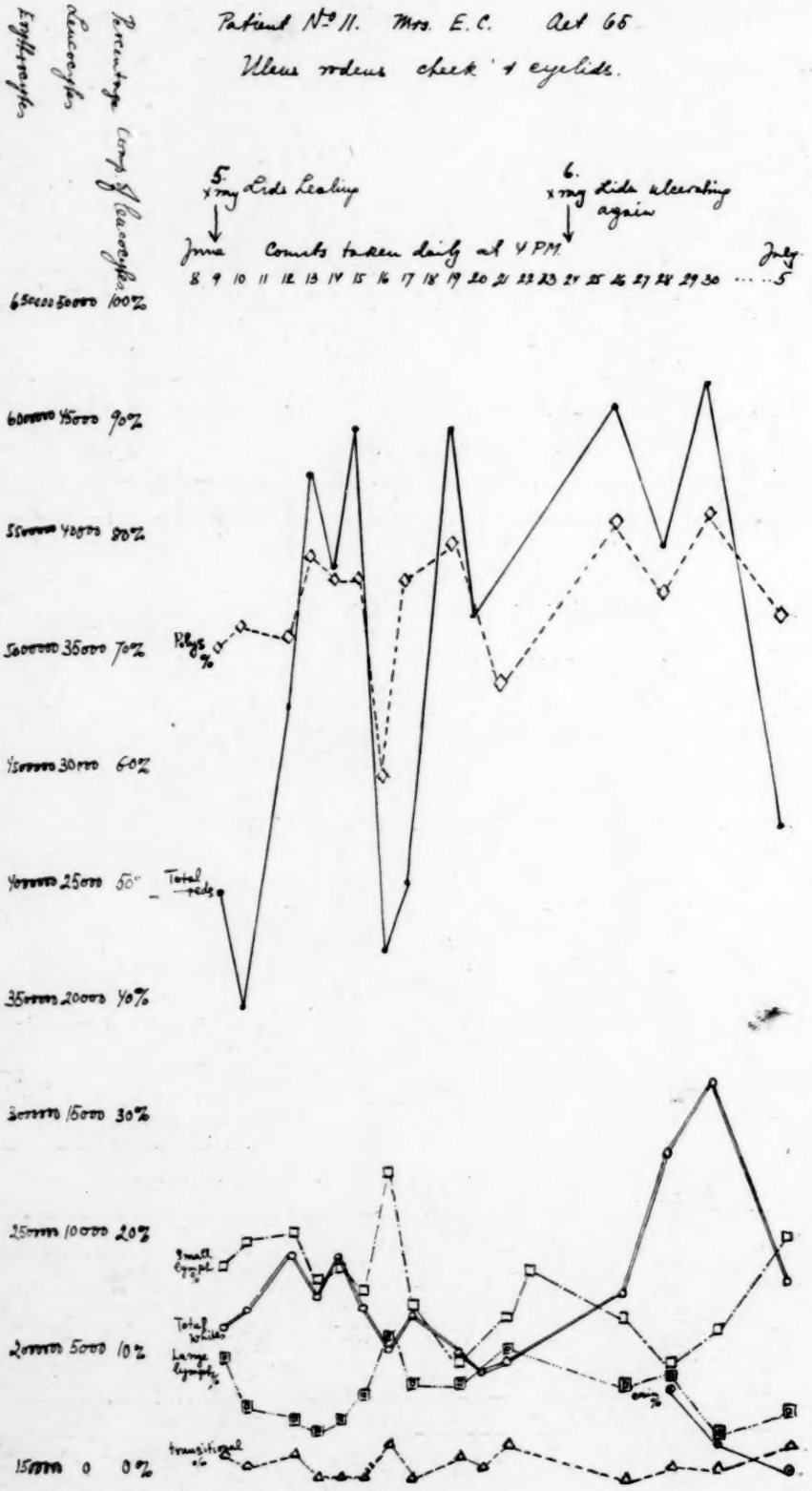
A second treatment was given twenty-four days after the first. The counts were not taken until nine days later. There

TABLE 11

CASE NO. 10.—RECURRENT ADENO-CARCINOMA OF CHEST, NECK, ETC.

DATE	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
~~1916~~ 5-16	* X RAY								
5-19	1	13500	10395	3105	2160	945	16	7	23
5-20		7500	6150	1200	1125	75	15	1	16
5-21		6300	4940	1235	785	450	12	7	19
5-22		6300	4725	1512	1449	63	23	1	24
5-23		7500	6150	1350	1125	225	15	3	18
5-24		6800	4964	1700	1360	340	20	5	25
5-25		7500	5625	1425	1050	375	14	5	19
				* OPERATED 3 DAYS BEFORE					

CHART XI


Patient No 11. Mrs. E.C. Aet 66
Ulcus rodens cheek + eyelids.
Percentage Comp. of Leucocytes
Leucocytes
Erythrocytes
5. x ray Lids healing
6. x ray Lids ulcerating again
Counts taken daily at 4 P.M.
June
July
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 5
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Polys %
Total reds
Small lymph %
Total whites
Large lymph %
Eos %
transitional %

was no increase for nineteen days following. Then the third dose was given. There is no record of a count for twenty-six days. The daily count for the following twelve days shows no reaction, the lymphocytes dropping below normal. This patient died a few weeks later.

Patient No. 3, Chart III, aet. 73. Carcinoma of the descending colon. Exploratory operation. The blood count began the day of the first treatment and was

TABLE 12

CASE NO. 11.—BASAL-CELLED CARCINOMA OF EYELIDS, CHEEK, AND TEMPLE

DATE 1916	NO OF COURSE OF TREAT	TOTAL WHITE	POLYS	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
6-9	5	6500	4615	1820	1170	650	18	10	28
-10		7200	5256	1872	1440	432	20	6	26
-12		9500	6840	2490	2015	475	21	5	26
-13		7800	6162	1630	1318	312	17	4	21
-14		9500	7315	2185	1710	475	18	5	23
-15		7200	5544	1656	1122	534	16	7	23
-16		5500	3300	2090	1430	660	26	12	38
-17		7000	5390	1610	1050	560	15	8	23
19		5500	4400	990	550	440	10	8	18
21		5000	3400	1250	700	550	14	11	25
24	6								
26		8000	6560	1760	1120	640	14	8	22
28		14000	10640	2660	1400	1260	10	9	19
30		17000	14110	2890	2210	680	13	4	17
7-5		8500	6290	2295	1785	510	21	6	27

discontinued for ten days. There was no reaction on or about the fourteenth day. Nor was there any reaction for twelve days after the second dose, the number of lymphocytes dropping to below normal. This patient is slowly sinking.

According to these tables, there is very little or no lymphocytosis following roentgen treatment of hopeless cases.

SUMMARY

The object of this study was primarily to determine the relationship between changes in blood counts of cancer patients being treated with roentgen rays and the progress of the case.

This contribution is not intended as a final report, and consequently no final conclusions could safely be drawn from the few cases reported. There is great need for further research work along this line, not only in cancer but in other diseases and in normal individuals exposed to the roentgen rays. In this research, however, it is quite evident that complete blood counts and hemoglobin estimation should be made almost daily over a considerable period of time—a very large undertaking—before fair comparisons can be made.

The data at hand would seem to justify the following conclusions.

(1) Roentgen rays, applied in repeated large doses, with deep penetration, profoundly affect the erythrocytes of human beings, contrary to most of the reported experiments on small animals.

CHART XII

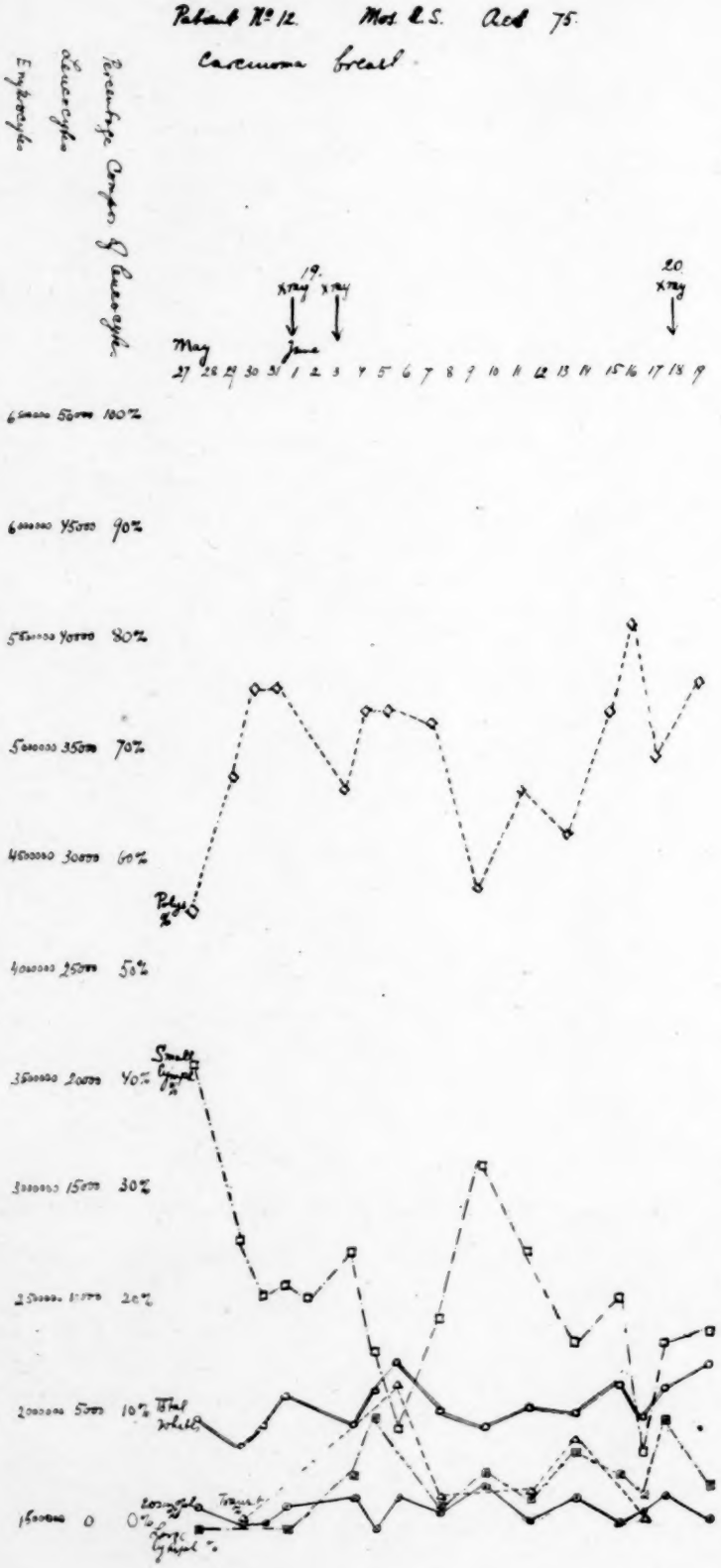

Patient No 12. Mrs L.S. Age 75.
Carcinoma breast
Erythrocytes
Leucocytes
Percentage Compass of Leucocytes
X ray 19
X ray
X ray 20
May
June
27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
6,000,000 5,500 100%
6,000,000 5,000 90%
5,500,000 4,500 80%
5,000,000 3,500 70%
4,500,000 3,000 60%
4,000,000 2,500 50%
3,500,000 2,000 40%
3,000,000 1,500 30%
2,500,000 1,000 20%
2,000,000 500 10%
1,500,000 0 0%
Poly %
Small Lymph %
Total White
Eosinophile %
Transit %
Large Lymph %

TABLE 13

CASE NO. 12.—ADENO-CARCINOMA OF LEFT BREAST (NO OPERATION)

DATE 1916	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH.	TOTAL LYMPH.	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
5-27		5000	2800	2100	2100	0	42	0	42
5-29		4000	2720	1040	1040	0	26	0	26
5-30		4500	3420	945	945	0	21	0	21
5-31		6000	4560	1320	1320	0	22	0	22
6-1	19								
6-3	20	4900	3283	1470	1235	245	25	5	30
6-4		6500	4810	2340	1690	650	26	10	36
6-7		5500	4015	1155	1045	110	19	2	21
6-9		4800	2784	1824	1536	288	33	5	38
6-11		5500	3630	1540	1385	165	25	3	28
6-13		5400	3402	1296	918	378	17	7	24
6-15		6600	4884	1716	1386	330	21	5	26
6-16		5000	4100	500	350	150	7	3	10
6-17		6500	4550	1755	1105	650	17	10	27
6-18									
6-19		7500	5775	1650	1350	300	18	4	22

(2) For the first few days, the lymphocytes are suppressed or destroyed by large doses of roentgen rays in the treatment of cancer. In favorable cases, this is followed by a reaction with lymphocytosis between the third and seventh days, which may continue almost uninterruptedly till the fourteenth day, or it may

TABLE 14

CASE NO. 16.—CARCINOMA OF OMENTUM, ETC. (EXPLORATORY OPERATION)

DATE 1916	NO OF COURSE OF TREAT	TOTAL WHITE	POLY-MORPH.	TOTAL LYMPH	TOTAL SMALL	TOTAL LARGE	% SMALL LYMPH	% LARGE LYMPH	% TOTAL LYMPH
5-1	1	13320	10123	3073	1475	1598	11	12	23
6-15	3	9200	7084	1840	1196	644	13	7	20
7-6	5								
7-7	5	7200	4680	1584	1008	576	14	8	22
7-20	6	8800	6072	1936	1320	616	15	7	22
7-21	6	12500	8625	3375	2375	1000	19	8	27
8-8	7	6500	5395	910	325	585	5	9	14

CHART XIII

Patient No 13. Mrs. K.

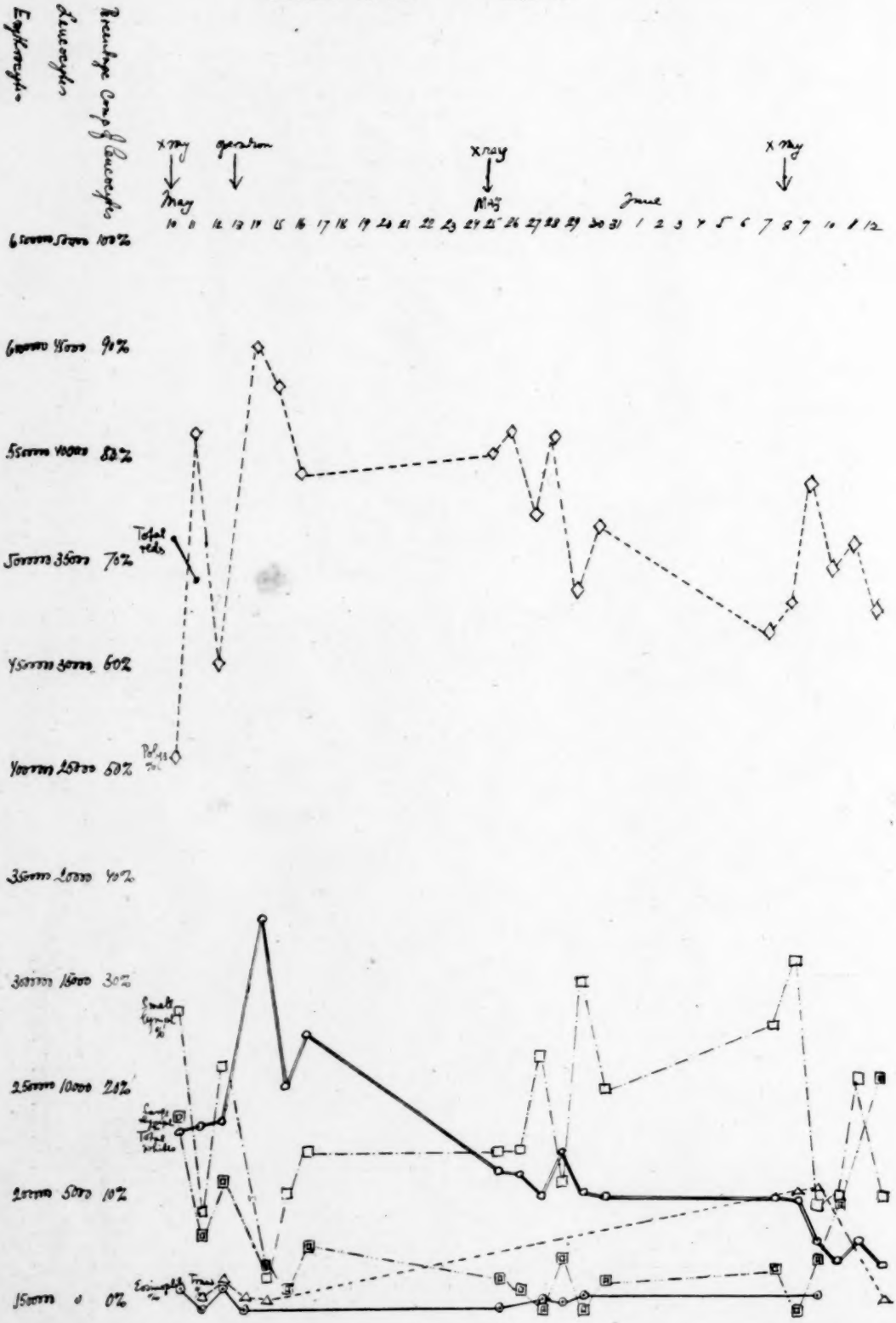


CHART XIII (*Continued*)

Mrs K Patient No 13
X Ray
X Ray
July
13 21 22 23 24 25 26 27 28 29 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 2
Polys %
Small lymph %
Total white
Large lymph %
Eosinophiles %
Transitionals %

CHART XIV

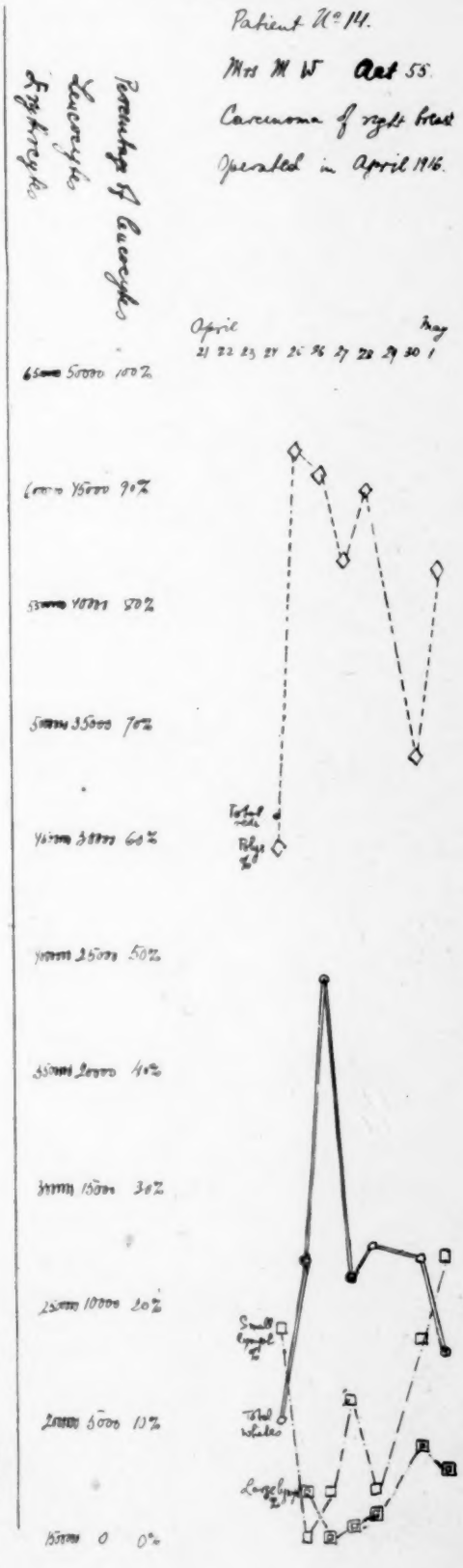


CHART XV

Patient № 15 Mrs. M.C.

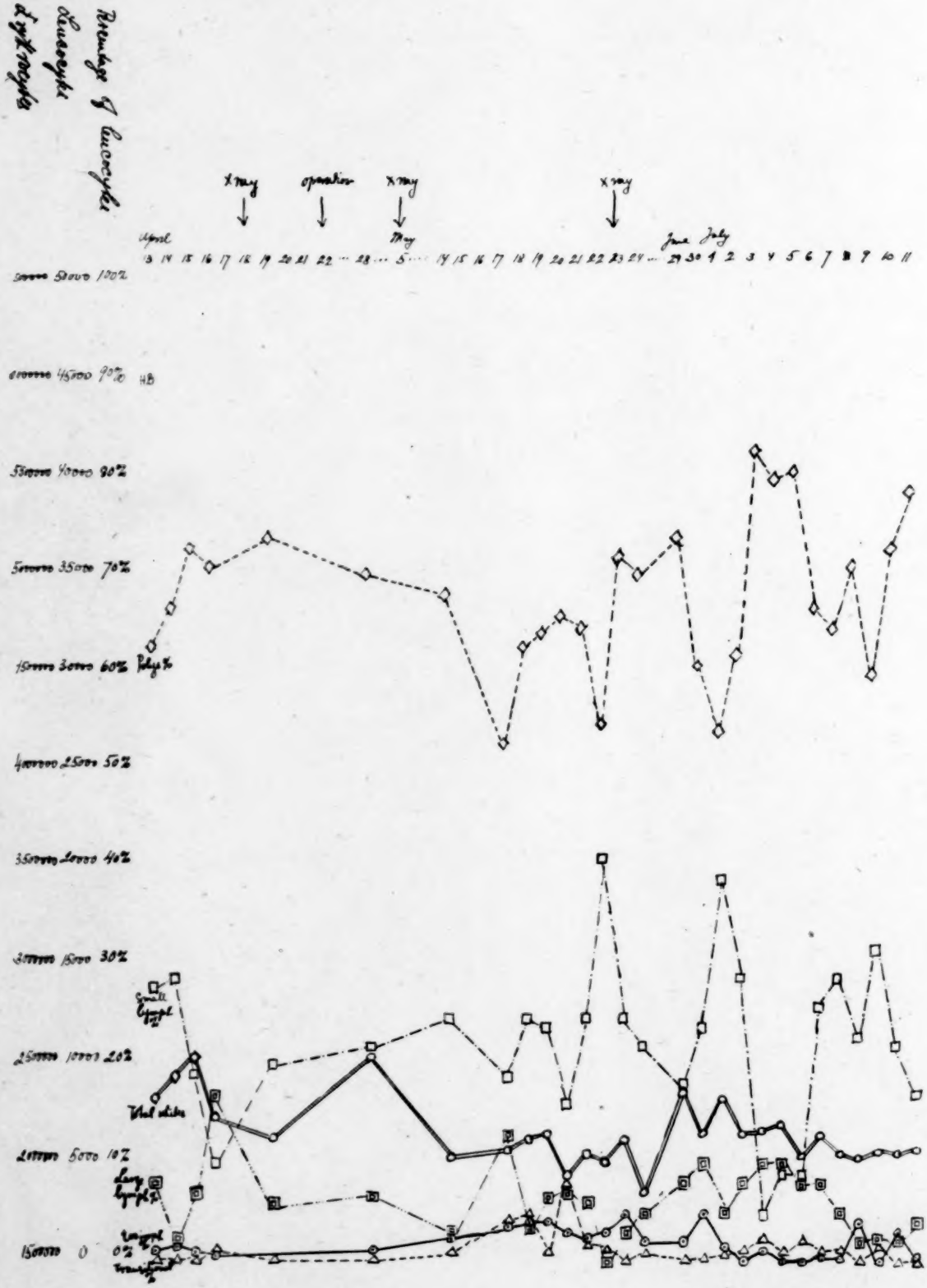


CHART XVI

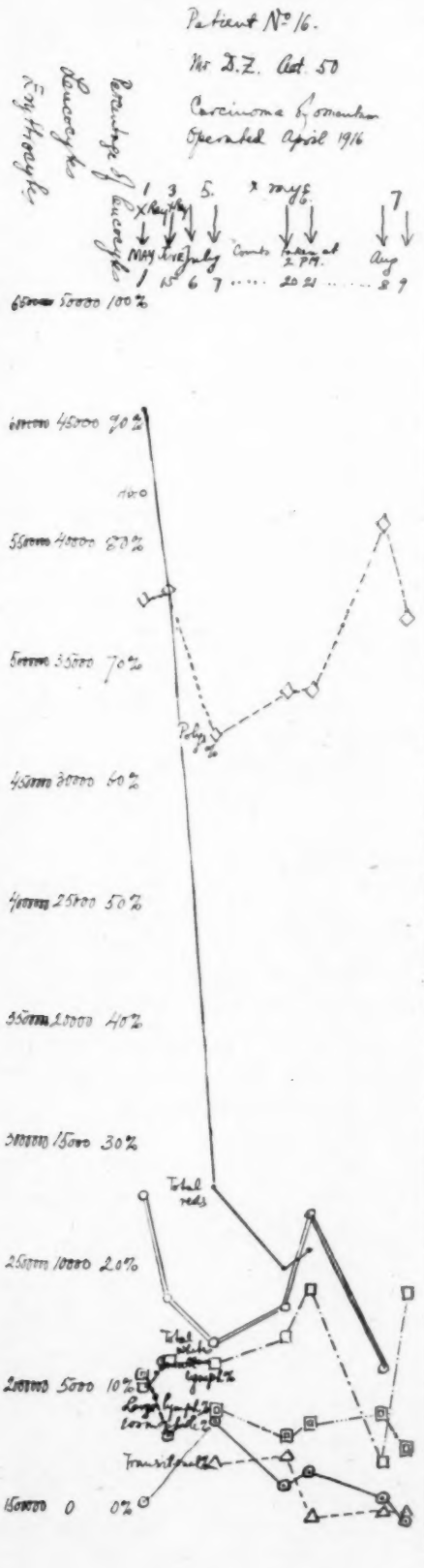


CHART XVII

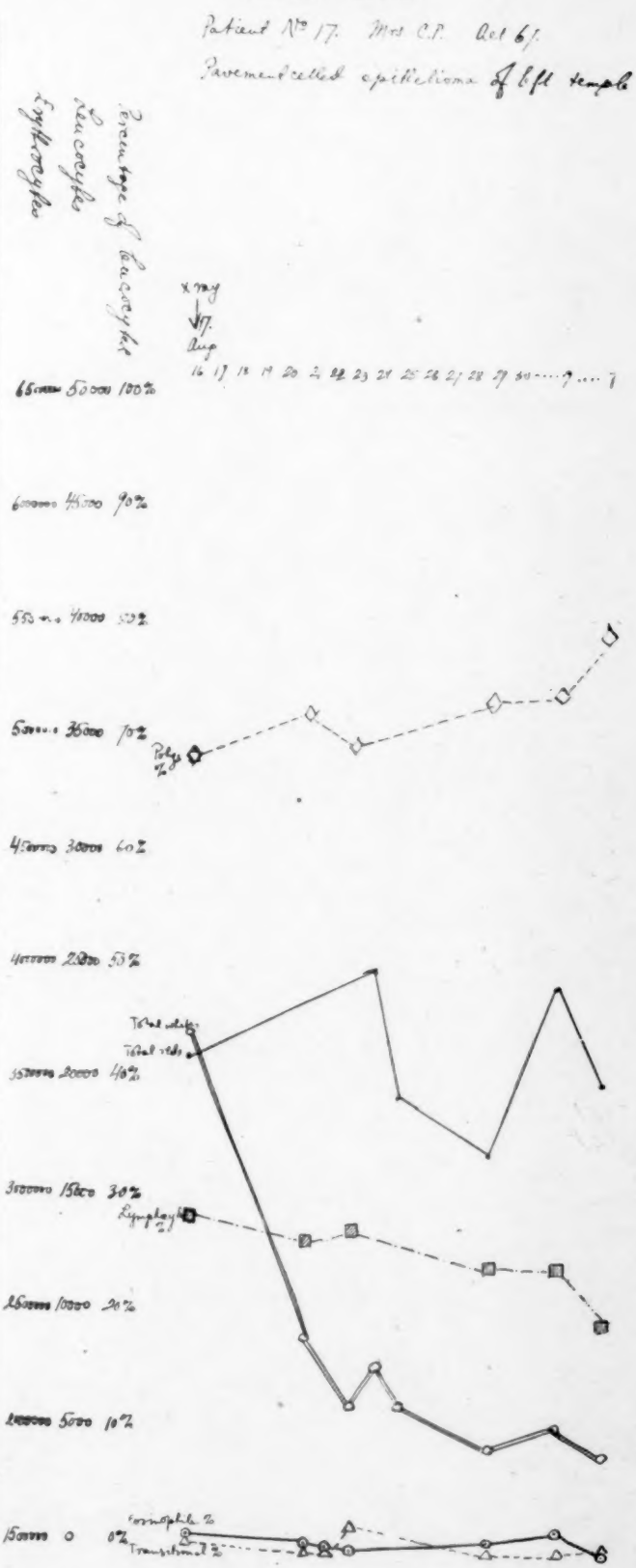
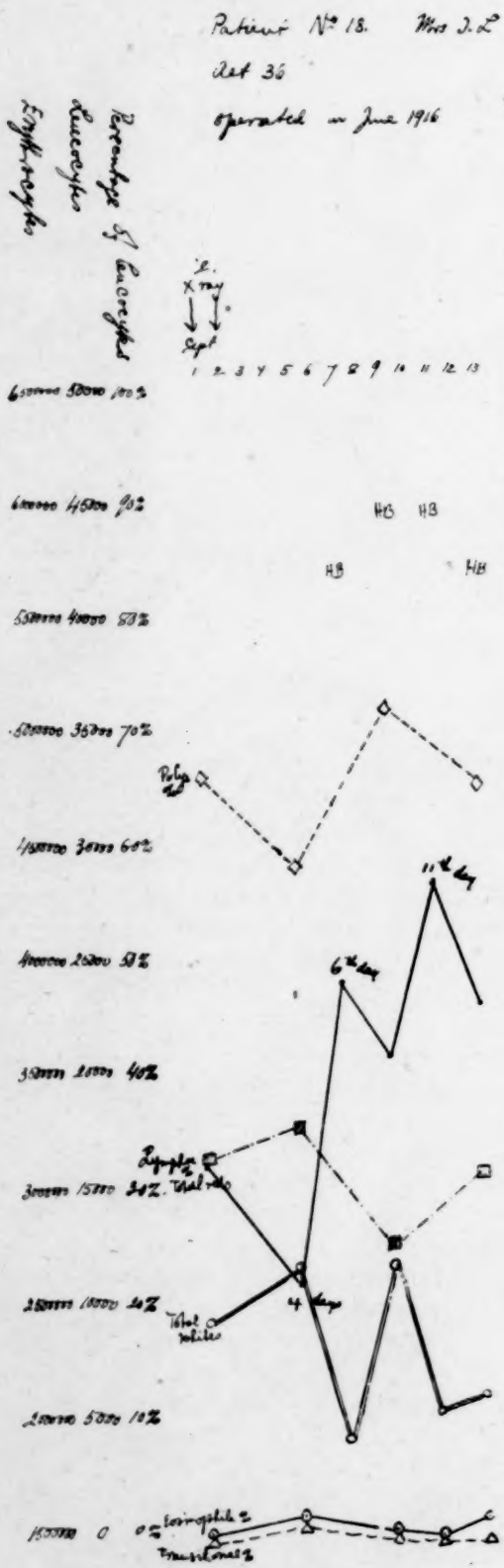


CHART XVIII



stop shortly after the seventh day and reappear more strongly and persistently on or about the fourteenth day. We note the striking similarity between this and the action of the rays on the blood of lower animals.

(3) There is a strong resemblance between the curves of these lymphocytic reactions and those which constitute the opsonic index. The treatment should probably not be repeated until the reaction is over.

(4) The repetition of the dose should probably be governed by the reactions in the blood as well as in the skin, the former being much more sensitive than the latter.

(5) In some cases of cancer, the roentgen rays tend to stimulate a general (though probably temporary) immunity, if lymphocytosis is an indication of immunity. The action of the roentgen rays in cancer, therefore, would appear to be twofold: local, by its destruction of disease cells; and general, by stimulating lymphocytosis and, consequently, resistance.

I wish to express my appreciation for the careful and painstaking work of Mr. Chas. Sziklas, who made nearly all of the blood counts herein mentioned, and assisted greatly in preparing the charts and tables.

REFERENCES

COLWELL AND RUSS. "Radium, *X*-ray, and the Living Cell." Bell & Co., London, 1915.

GOCHT. "Handbuch der Röntgenlehre," 3d. Auflage.

KÜPFERLE. "Ueber Röntgentiefentherapie der Lungentuberculose." *Fortschr. auf. d. Geb. d. Röntgenstrahlen*, Bd. 21, 41.

MURPHY, JAS. B., AND MOTON, JNO. "The Effect of Lymphoid Destruction on Induced Immunity of Transplanted Cancer." *Journ. Exp. Med.*, Vol. 22, 1915, p. 204.

SENN, N.

TREHER, HANS. "Veranderungen des Blutes durch Aktinotherapie," *Strahlentherapie*, Heft 14 (Originale), Bd. VI, p. 389.

L'HERMITTE, J. "Modifications du sang chez les radiologues," *La semaine médicale*, 31 Janvier, 1912, No. 5, p. 50-51.

WARTHIN. "Action of the Roentgen Rays on Blood and the Blood-forming Organs." *Strahlentherapie*, Bd. IV., p. 722.

WETTERER. "Handbuch der Roentgentherapie," 1913-1914, Vol. I, p. 256 et seq.

DISCUSSION ON PAPERS OF DRS. STEVENS, HOLDING,* BOGGS AND JOHNSTON

DR. GEORGE E. PFAHLER, Philadelphia. —As Dr. Stevens stated, this work is important and these blood counts must be made daily. I have made some study of the blood in these cases, but I am sorry to say I was not very well satisfied with the results, so that I am not so hopeful of the blood counts as a guide in our treatment. However, I trust that Dr. Stevens will go on with his work and prove that my impression is wrong.

From clinical experience, I have arrived at the conclusion not to repeat a course of treatment inside of four weeks, because the patients get along better and there is far less danger of burning. In a number of instances, Dr. Stevens stated that patients had received eight treatments. Keeping in mind our present line of action in deep therapy, it is hardly sufficiently clear to refer to a series of treatments as a treatment. Hearing some one say that he had given a treatment, we hardly know whether it means giving a dose through a certain port of entry, or a series of doses through many portals of entry. I would suggest, therefore, that we use the designation of "course of treatment" as referring to a series of treatments given through many portals of entry. I am using the term in that way, because it means something definite and both laymen and doctors understand what is referred to by a "course of treatment." It means a definite line of treatment which is repeated at intervals. I believe we will all understand one another better if we adopt this term.

Dr. Holding has presented some excellent work. I think it is by far the best work he has ever done. I can agree with him in all he said, because his explanation of the reason for the success and failure is correct. This work should prompt us to insist, or at least urge, that we be permitted to treat patients as soon after operation as possible, or at the earliest possible time, if the patient is not to be operated on. Then, too, I think that we must be very cautious, as Dr. Holding advises, in making a prognosis, and we must be sure not to stop the treatment until the patient is well. The case he referred to, a large embryonal carcinoma of the chest, in which he stated that the tumor was made to disappear, might be interpreted somewhat differently. I thought I could see very clearly the shadow of a tumor in the last picture he showed us. This emphasizes the statement that we should not stop our treatment until we are quite sure that the disease has disappeared.

Dr. Johnston has brought up a very important subject, that of immunity. I am sure that there is a natural resistance on the part of many patients and probably on the part of all of us, even though we do not have cancer, which we should in some way learn to recognize. A number of years ago I reported the case of a woman who came to me with a large recurrent mass of carcinoma in the supraclavicular region and extending backward from the operative area on to the back in the form of subcutaneous nodules. She came to the office at the end of a very heavy day's work and I gave her a single dose over the front of the chest, more for the purpose of eliminating any fear of the ray which the patient might have than with the hope of accomplishing much. Two days later, she returned, supposedly for a treatment. I found that most of the nodules on the back, which were not exposed directly to the ray, had disappeared. I must have stimulated her antibodies in some way and thus the absorption of the tumor cells was hastened. Under further treatment she became entirely free from symptoms and every evidence of the disease. I showed her at a meeting of the Clinical Congress of Surgeons in Philadelphia and a number

* Dr. Holding's paper was published in the April issue.

of surgeons examined her. They all expressed the opinion that the disease had disappeared. A few weeks later, however, the woman returned with recurrences and she died soon afterward. I have always felt that there must have been some malignant cells remaining in the tissues and that the manipulations of the surgeons probably dislodged these cells and stimulated them into activity.

I agree with Dr. Johnston that we must carry out the idea of being cautious in our prognosis but hopeful in our efforts. By doing so we will be helpful to many patients even though we may not get them well.

DR. EMIL BECK, Chicago.—I want to present a case of interest, one which teaches several valuable lessons. The patient came to me last April complaining of shortness of breath, loss of weight, a cough, and on examination I found enlarged glands in both sides of the neck, especially in the supraclavicular region, and also a mass in the axilla. She had been treated for two or three years for pulmonary tuberculosis. A roentgenogram was not made at that time. She not only failed to improve but continued to lose weight and became more anemic. When she came to me, I had a set of stereoroentgenograms made to see how far the tuberculosis had extended. Instead of a tuberculous disease the roentgenogram showed two tumor masses in the posterior mediastinum pressing against the heart. From this I made a diagnosis of Hodgkin's disease and took the patient to Dr. Billings to confirm my diagnosis. He concurred with me in the diagnosis and stated that the case was apparently hopeless, but suggested that we try roentgen therapy, which we did. Dr. Eisen gave a course of treatment, extending from April 26 to July 13. Much to our surprise not only did the symptoms disappear, but also all the enlarged glands above the clavicle and in the axilla, as well as the tumors in the chest. I had extirpated a gland from the axilla for the purpose of making a vaccine and also to prove the correctness of the diagnosis. When we examined the specimen, we found that it was not Hodgkin's disease at all, but a lymphosarcoma. The patient has apparently made a complete recovery. She has gained in weight, feels well and is active. We did not give her any vaccines, because we failed to confirm the original diagnosis of Hodgkin's disease.

DR. A. L. GRAY, Richmond, Va.—A very important point, and one on which I would like to have some information is, What are we to do as a routine postoperative procedure in cases in which there is no manifestation or metastasis. We have patients referred to us after a radical operation for carcinoma of the breast, who have come from a considerable distance and who can ill afford to remain with us very long or go home and return for treatments. In these cases, it is necessary to know how long we should continue the treatment before it is safe to discharge the patient. It is my custom to administer, as soon after operation as possible, a series of cross-fire treatments with the Coolidge tube. I have the patient return in three or four weeks for another series of treatments and then again after the lapse of the same period of time. Of course, this is in the absence of any recurrence or remaining traces. After about six months, I request the patient to return again for a final treatment. I would like to know what others are doing in such cases. We should not make these patients come back oftener than is necessary, and yet we want to be satisfied that we are giving enough treatment.

DR. RUSSELL H. BOGGS, Pittsburgh, Pa.—I do not think that we want to say just how many treatments should be given after operation, because each case must be judged individually. Dr. Crile, of Cleveland, thinks that these patients should have as much roentgen treatment during the first six months after the operation as the skin will stand, because no one knows how

malignant a case might have been, nor whether there was any involvement of the mediastinum. We want to make roentgenograms before operation and afterward, in order to check up on the effect of the treatment. I usually give a course of treatment as soon after the operation as possible, repeating the treatment four weeks later and then again after three months. The indications for treatment after that should be controlled by the findings in the roentgenograms.

DR. GEO. C. JOHNSTON, Pittsburgh.—In a case of undoubted carcinoma of the stomach, confirmed at operation and microscopically, a pylorectomy was done and the patient is now living, three years after the operation.

DR. A. F. HOLDING, New York City.—I have attended many cancer meetings in the last few years. In some of them I heard surgery from start to finish, while here emphasis is placed on the radio-active measures. The point is how are we going to bring the facts brought out today to the attention of the surgeon. Perhaps, continued hammering away at the subject will have the desired effect. At present, the laity places emphasis on surgery, and we must determine what that means. If radioactive measures are a part of surgery, then surgery is necessary; otherwise not.

In regard to Dr. Stevens' paper, it is so important that a whole morning could be spent profitably in discussing it. The dose that Dr. Murphy of New York gives is so insignificant that I do not even want to speak of it. He does not repeat the dose for six weeks for fear of interfering with the lymphocytosis which he has produced with his little dose. He uses a 3-inch spark, no filter, 2 or 3 milliamperes of current for ten minutes, and he is careful to keep away from every place where he thinks there may be a tumor.

Before the treatment is given, it is essential to have the blood count made every day for two weeks, so that you can tell what the variation is; then give the treatment and make daily blood counts thereafter, watching the curve of the lymphocytes closely. Do not make any more exposures while the lymphocytes are going up, because the roentgen rays destroy the lymphocytes. When the number of lymphocytes is falling off, give another dose. We have heard about treatments with the roentgen rays every day, once in two weeks, once in four weeks, but the whole idea of the blood picture is to have daily blood counts and then treat accordingly. It is difficult to get any one who is treating cancer cases to make daily blood counts in every case, unless he has an assistant to devote all of his time to that work.

The matter of immunity is a most important one, but before we can be very definite in our statements we want to standardize our technic. The labor involved in connection with a large series of cases almost prohibits very extensive blood work.

Perhaps these papers suggest a line of thought which may help us. Dr. Murphy's work on rats certainly appears to have produced results. I should like to focus your attention on the nucleus of the cell and its blood supply, but remember that everything depends on the natural immunity of the patient.

With regard to the postoperative treatment of breast tumors, we do not treat very heavily over the place of excision, because the roentgen ray causes a roughening of the endocardium on the inside of the capillaries and this may tend to shut off the circulation. Other areas of the skin are treated, in the axilla, on the back and above the clavicle. The minimum I give my patients is three cross-fire series over every area of intact skin and one series over the incision. A series consists of four areas on the front and four on the back, giving the ray so as to cross-fire the mediastinum, and two areas on the side over the axilla and in the axillary line. If the left breast has been removed, for instance, I would treat four areas in front at once, and then

would not treat it again, four areas on the back three times, and four areas in the axilla, where there was not a wound, three times; then give to the other breast three series, four areas in front, three series four areas in the back, three series two areas under the arm and three series one area above the clavicle on the other side, and if there is no incision over the clavicle, on the operated side, I would give three series one area. Where there is a line of incision, give only one series.

A POSSIBLE ROENTGEN SIGN IN CERTAIN TYPES OF MESENTERIC CYSTS*

BY CLARENCE F. BALL, M.D.

RUTLAND, VT.

IN a search of the literature I have failed to find any reference to the use of the roentgen ray as a method of diagnosing mesenteric cysts. In fact, nearly all authorities express agreement with the following statement made by R. T. Miller, in 1913: "The fact that a cyst of the mesentery has never been positively diagnosed before operation or autopsy is conclusive evidence that distinctive signs and symptoms do not exist or have escaped recognition."

The case I wish to report is one of those that have evidently escaped such recognition. Finding no roentgen literature dealing with mesenteric cysts will in part explain any faulty observation, although the plates have been as illuminating before the operation as after.

The patient was an Italian baker, 39 years old, who had come to this country 16 years ago. Family and personal history negative. Some ten or twelve years ago the patient was told by his physician that he had "fluid" in the left flank and ought to be "tapped." He refused this advice but was medically treated, obtaining symptomatic relief. Patient continued working throughout the treatment. About a year ago he again noticed an enlargement of the abdomen with a feeling of fulness, beginning in the left flank as before, and giving rise to dyspnea, gastric and intestinal distress. At that time his appearance resembled that of a woman at full term except that the crest of the tumor appeared still higher. The picture presented was almost identical with the photograph of a case of cystic tumor due to a retained testicle, reported by Outland and Clendenning. Sarcoma of the retroperitoneal glands was most seriously suspected, as the tumor was too hard to suggest a cyst, although the remark was made at the time of the roentgen examination that it held back the roentgen rays as though it might be a cyst. Likewise it was considered possible that the enlargement might be due to an unusual development of the spleen. A hydronephrosis and hypernephroma were considered but practically excluded upon the ground of a perfectly normal urinary output, although at no time had the patient been cystoscoped.

Roentgen Examination.—The roentgen examination showed the bismuth-filled stomach lying diagonally to the extreme right side of the upper abdomen, crowded up under the shelving edge of the liver. Below the laterally and diagonally placed stomach are the overlapping shadows of the bowel and colon, the latter organ being injected with bismuth and buttermilk. The most prominent feature of the examination was the extreme displacement of the descending colon which had been pushed by the cyst to the extreme right flank.

* Read at the Seventeenth Annual Meeting of the American Roentgen Ray Society, Chicago, Ill., Sept. 27–30, 1916.

Operative Findings.—Operation through a central incision above the umbilicus revealed an enormous, rather smooth, lobulated mass covered with a large number of tortuous, superficial veins and arteries. The general appearance was that of a bloody tumor, probably sarcomatous in nature. The tumor was considerably larger than the patient's head and completely displaced everything in the left abdomen. It held close upon two gallons of a straw-colored fluid of a slightly oily nature. The cyst was imperfectly divided into three or four compartments, one of which was well separated from the others. The descending colon was found lying along the right edge of the tumor mass and completely attached to the cystic wall. The cyst was opened through the median skin incision about three inches to the left of the attachment of the descending colon to right border of cyst. The tumor filled the intraperitoneal space of the mesentery of the descending colon, thus making the colon itself an integral part of the wall of the cyst. Radical removal under these anatomic conditions was considered unwise. Accordingly, a stab wound was made just above the crest of the left ilium and the puncture wound of the cyst was sewn into this, bringing the descending colon almost back to its normal position in the left flank.

The patient made an uneventful recovery with but slight drainage through the stab wound, and resumed work six or seven weeks after the operation. No further trouble occurred until July, 1916, when the patient again noticed a filling in his left side. Another roentgen examination was made and the patient was instructed to report again in four to six weeks for further observation. In the meantime, however, the condition grew so serious that operation was performed during my absence from town without any further roentgen examination having been made. This time four quarts of a "more or less purulent, straw-colored fluid were removed." The tumor had not, however, filled at this time to more than about two-thirds its size at the time of the first operation.

The cyst undoubtedly arose from a sequestrated, retroperitoneal lymph gland, and it is probable that the gland was situated near the origin of the mesentery of the descending colon. Due to the embryologic development of the mesentery, we find the blood vessels and lymphatics more intimately connected with the posterior surface than the anterior. Theoretically, it might seem more probable for one of the glands of the mesentery of the colon to become sequestrated inasmuch as there are only very few as compared with the large number of glands present in the mesentery of the small bowel. This glandular arrangement seems to conform to the different duties of these two portions of the intestinal tract. The large number of glands in the mesentery of the small bowel aid as well as protect the normally quite sterile absorbing portion, while only a few glands stand guard in the mesentery of the highly infected wastepipe colon. It would seem that a glandular sac might more readily become isolated from the developing lymphatic system of the colon than from the more highly specialized portion supplying the small bowel. While some claim that they are more frequent about the ileum, it would seem that the larger ones appear more frequently associated with the big bowel.

The point of interest in the roentgenograms of this cyst is the complete transposition of the descending colon together with a partial malposition of the transverse portion. Furthermore, the roentgen examination more than confirms the physical findings, according to which the only tympanitic portion of the stomach was just below the ribs on the right side and down the right flank. Percussion gave no information as to whether this merely involved the stomach and ascending colon with a portion of the small bowel or all of the abdominal viscera, while the roentgenograms showed conclusively that the dense

area displaced all of the abdominal contents. A partial rotation only was observed during the later roentgen studies when the cyst began to refill, showing the rectum and descending colon in the central portion of the abdomen, with the splenic flexure, stomach and transverse colon in their normal positions.

Theoretically, cysts of any size would at all times tend to disarrange the normal bowel relations and intercept the passage of the roentgen rays in such a way as to definitely demonstrate the presence of cysts. In certain types of cases this area of density would be found to be movable if the cyst originated in a pendulous portion of the mesentery, while the shadow would seem fixed if the cyst arose from the root of the mesenteric attachment.

Roentgen findings, then, become of diagnostic importance for the determination of certain types of cystic formations by the fact that they show the degree of rotation at a certain portion of the bowel away from its normal position. It is obvious that small cysts would not be thus detected and will remain among the class of cysts found accidentally at the operating table or autopsy. It would seem, however, that a certain number of the larger cystic formations should be more or less accurately diagnosed roentgenologically by the fact of their intercepting the roentgen rays and by their tendency to displace a portion of the intestinal tract. It should not be difficult to distinguish between bowel displacement due to the solid abdominal tumors and mesenteric tumors, as the former would give a varying set of shadows, while those of mesenteric tumors would remain fixed.

Much discussion has taken place as to the origin of these rare tumors, but recent observations tend to show that the majority are of embryologic origin, and the various views held on this and kindred topics in connection with mesenteric cysts will be found in the appended bibliography. If the aid of the roentgenologist is invoked more frequently in the future both in suspected and clinically recognized cases, a further step will have been taken not only toward their correct diagnosis and treatment but also toward solving the question of their etiology in the diversified conditions under which they occur and develop.

BIBLIOGRAPHY

BENEDICT, A. L. "Bibliography of Chylous Cysts of the Mesentery." *Surg., Gynec., and Obstet.*, June 1913, V. 16, pp. 606–610.

CHILD, STRONG AND SCHWARTZ. "Mesenteric Cysts." *Amer. Jour. Obstet.*, Sept. 1913, V. 68, p. 491.

CHILTON, LEO W. "Mesenteric Cysts." *Northwest Medicine*, Nov., 1915.

DOWD, CHARLES N. "Mesenteric Cysts." *Annals of Surgery*, 1900, V. 32, p. 515. *Ibid.*, 1915, V. 61, p. 481.

HADLEY. "Mesenteric Cysts." *Surg., Gynec., and Obstet.*, Feb., 1916, p. 174.

JONES, EDW. G. "Cysts of the Mesentery, with a Report of Three Cases." *Surg., Gynec., and Obstet.*, July 1915, V. 21, p. 56.

MAKINS, GEO. H. "Retroperitoneal and Mesenteric Cysts of Simple Nature." *Annals of Surgery*, March 1911, p. 355.

MESENTERY, THE. "Keen's Surgery." Vol. 4, p. 633–639.

MILLER, ROBT. T., Jr. "Enterogenous Mesenteric Cysts." *Johns Hopkins Hosp. Bull.*, Oct., 1913, V. 24, p. 316.

ROSENBLADT, F. "Mesenteric Cysts." *Jour. Iowa State Med. Soc.*, Oct., 1915, V. 5, p. 433.

OUTLAND AND CLENDENNING. "Mesenteric Cysts." *Surg., Gynec., and Obstet.*, Feb. 1916, p. 204.

THE AMERICAN JOURNAL OF ROENTGENOLOGY

PUBLISHED BY PAUL B. HOEBER, NEW YORK CITY

Issued Monthly. Subscription, $5.00 per year. Advertising rates submitted on application. Editorial office, 124 Manchester St., Battle Creek, Mich. Office of publication, 67–69 East 59th Street, New York

OFFICIAL ORGAN OF
THE AMERICAN ROENTGEN RAY SOCIETY

President
LEWIS GREGORY COLE, M.D.,
103 Park Ave., New York, N. Y.

First Vice-President
EDWARD S. BLAINE, M.D.,
104 So. Michigan Ave., Chicago, Ill.

Second Vice-President
HOWARD E. RUGGLES, M.D.,
233 Post St., San Francisco, Cal.

Secretary
WILLIAM H. STEWART, M.D.,
222 W. 79th St., New York, N. Y.

Treasurer
WM. A. EVANS, M.D., 32 Adams Av., W., Detroit, Mich.

Executive Committee
H. W. VAN ALLEN, M.D., Springfield, Mass.
DAVID R. BOWEN, M.D., Philadelphia, Pa.
HOLLIS E. POTTER, M.D., Chicago, Ill.

Publication Committee
EDWARD H. SKINNER, M.D., Kansas City, Mo.
GEORGE C. JOHNSTON, M.D., Pittsburgh, Pa.
P. M. HICKEY, M.D., Detroit, Mich.

Librarian
H. W. DACHTLER, 224 Michigan St., Toledo, Ohio

Editor
JAMES T. CASE, M.D., F.A.C.S., Battle Creek, Mich.

EDITORIALS

THE WAR CALL

We are at war. There is no need in medical circles to appeal with patriotic eloquence to the nobler feelings of the individual to strain every nerve to do his duty. The members of our profession are with one consent imbued with the holy zest of helping wherever the fate of physical sufferers can be relieved by their ministrations. The horrors of war have stirred up the emotions of the American physician to such an extent as to actually establish himself on foreign battle fields to render succor to the soldiers of other nations, to treat their wounds and injuries, received over quarrels to which we were no party.

The picture of the world has changed. As peaceful bystanders we have been thrust into the turmoil. Our own soldiers, the best blood that the American nation can call its own, are on the verge of offering their lives and limbs on the altar of their country. The task of the American physician is now no longer one of humanity alone, but also one of patriotism. A combination of stronger emotions can not be easily conceived.

As an individual, the physician can not accomplish much; united and organized, the profession can do a great deal. With adequate thoroughness, at the suggestion of the Advisory Commission, on which Dr. Franklin H. Martin is medical representative, the Council of National Defense has established a Medical Section, of which Dr. F. F. Simpson is the chief. Dr. Simpson has just sent out a memorandum of information to physicians, stating what the Medical Section is prepared and preparing to do, and what it expects the individual physician to do. Needless to say that in the present state of roentgenological advance the practitioners of our specialty feel more than ever the duty resting upon them to place what help they can at the disposal of their country in times of need.

Dr. Lewis G. Cole, in his capacity of President of the American Roentgen Ray Society, and the Editors have taken steps to prepare a special war number of this journal which will be devoted to the task devolving upon the roentgenologists of this country from a military point of view, and the ways and means how best to meet

them. Dr. Cole has circularized the members of the Society, asking for information concerning their physical fitness for duty, their willingness to serve and their attachments in military organizations. Doubtless there are hundreds among our readers who could serve their country in field and base hospitals in their roentgenological capacity, and it is requested that every member who is in a position to do so will write to Dr. Lewis Gregory Cole, 103 Park Avenue, New York, N. Y., indicating his willingness to serve and stating the fullest details respecting his qualification.

Dr. W. H. Welch, of Baltimore, the president of the State Board of Health, who has recently returned from the front, stated in an address before the Johns Hopkins Hospital Medical Society on November 6 (*Bulletin*, April, 1917) that on and around the foreign battle fields there is an opportunity of using to the full all the recent medical discoveries, advances and improvements in the way of inoculations against disease, in sanitary matters, pure water and incineration, and in the use of the roentgen ray which he declares to be of incalculable advantage in conditions of war. He adds: "There is no conceivable injury which is not inflicted in this war," and Sir A. Wright—of opsonin fame—insisted on Dr. Welch's seeing certain of his cases as he would "never have such a chance again."

Aside from the location and removal of projectiles, shell fragments and other foreign bodies, from the diagnosis and control of fractures and dislocations, the roentgen ray is also destined to play an important rôle in the early diagnosis of gas gangrene, thus being instrumental in the saving of many lives from a painful death which would inevitably occur in the absence of timely treatment.

André Binet, in his contribution to *Paris Médical* for March 10, 1917, has been prompted by his experience at the war hospital at Noisiel to state his conviction that with a roentgenological and surgical station properly equipped, and with good technic, the removal of projectiles is almost infallibly attended with excellent results, provided there are no anatomical difficulties in the way. Dealing with surgical technic, he lays stress upon the fact that before attempting an operation and during its progress the location of the projectile should be roentgenologically controlled.

Dr. Lever T. Stewart, who has likewise the benefit of personal experience on the battle field, contributes an article to the *Pennsylvania Medical Journal* for March, 1917, testifying to the efficacy of roentgen examination in emergencies and unexpected complications. "It is rare," he writes, "to fail in the search, and frequently one goes in to reach a foreign body apparently close to the surface and eventually removes it from the base of the brain, the region of the sacro-iliac joint, beneath a rib, etc." No proof was needed that roentgenology could do this and much more in the quiet seclusion of the roentgen clinic or hospital; the difficulty was to so adapt the experience of laboratory and hospital workers to the exigencies of war that help could be tendered whenever and wherever it was needed to save the lives, limbs and sufferings of the heroes who spill their blood for the good of their fellow country men and women who stay at home. European experience has shown that this object can be accomplished, and we feel assured that it requires nothing more than the steps taken by the president of the American Roentgen Ray Society to bring all the available roentgenologists of the country with one will and impulse to the forefront of helpers in the war—helping not to mutilate and slaughter but to repair what injury has been done to the bodies of patriotic American soldiers in the defense of their country.

Roentgen Rays in War Times

This Journal was the first to call editorial attention, in its issue for November, 1916, to the necessity and importance of roentgenological preparedness in case of war, pointing out the ways and means by

which European countries were availing themselves of the unequaled service of our art in the localization of foreign bodies and for other diagnostic purposes. The reason why this important subject could not as yet bear tangible results, in spite of the earnest considerations of the roentgenological fraternity, is the recognition of the fact that even a preliminary knowledge of American requirements and how to meet them was not available. To approach this subject with the vigor, earnestness and technical knowledge it demands, was the object of a special meeting convened by the New York and Philadelphia Roentgen Societies on March 3, 1917, and the meeting was fortunate in commanding an array of technical forces and a galaxy of inventive talent which bid fair to bring the issue before us within palpable limits of solution.

As Dr. Baetjer, who presided in the absence of Dr. Jaches due to the latter's indisposition, explained, there were as yet no set plans or programs, and he left those present to formulate their views and propositions in the light of whatever experience they might have gathered or possess.

Dr. Lyle, who has been abroad at the front for two years, spoke from the surgical side. As war surgery was the surgery of infection, the first problem was probably that of transportation so that the wounded man could be placed under the *x*-ray at the earliest moment to have projectiles and shreds of clothes extracted. The important point was the adequacy of the first treatment, as it determined the question whether the patient could be sent back to the firing line, when cured, or not. Dr. Lyle described the local conditions as witnessed by himself, where the nearest roentgen outfit was usually stationed in such places as small châteaux, school houses or the mayor's office. The French have developed a very light and quiet machine, using about 2 MA, which not only lessens the frequency of burns but also the noise. In other localities roentgenologists come up with their own automobiles and their own *x*-ray equipment to put up in the operating room and go to work on the spot. This part of the service could be used even more extensively in America, because in Dr. Lyle's opinion there are more trained roentgenologists here than in *La Belle France.* We trust his enthusiasm will be borne out by facts under the stress of emergencies.

Arrangements at the base hospitals were of a more permanent character, but evidently also dependent more on accident than system, and the function of the trained roentgenologist was principally to train and supervise the men who actually do the work. The roentgenologist was considered as important as the surgeon.

Major Huntington addressed the meeting from the military point of view. He explained that the organization of the Medical Department depended on working in three zones: the fighting zone at the front, the zone of the line of communication and the zone of the interior. In Europe these zones were very much different from what would be the case in this country. The advance zone, for instance, might be somewhere in the south of Mexico, the line of communication extending back to the border, and the zone of the interior in the United States. In France, the wounded men were frequently got out of the trenches to the base hospital within six hours; in the American parallel just described they would be lucky if the same result was accomplished in six days. He therefore cautioned his hearers that, while we were learning a great deal from European experience, we might also learn things that were not so in our own country. The fighting front had to be kept free for fighting purposes, and anything that hindered the free movements of the troops was not only not an aid but a distinct disadvantage, even in the shape of roentgenologists. For this reason the equipment of field hospitals must be very meagre and mobile as compared to that of the base hospital; this means that, if there is to be a roentgen service at the front or along the line of com-

munication, it must be transportable; and in the matter of transportation the necessary supply of clothes, food, ammunition, etc., takes precedence in all cases over the medical service.

Major Huntington advocated a more or less standard pattern or patterns of roentgen equipment for use in the service, according to the zone where it is to be employed. He had in mind an automobile truck that transported a machine with dark room for developing plates or films, supplying power for running the dynamo, and which was capable of carrying two or more induction coils and a few storage cells. Machines making much noise were objectionable at the front, as they were sure to draw fire. Thus the Medical Department had a gasoline engine which could not be used for this purpose on account of the noise it made. The Major further explained that he stood in the position of being required to advise the Surgeon-General's Office on everything in connection with roentgenology, and it would be of the greatest assistance and interest to that office if ways and means could be found to adopt a certain type of machine. Efforts in this direction were being made by the authorities. Their experience in Mexico with motors had been unfavorable, but the idea was not to demand a certain make of truck but a certain type to comply with specifications, and the same rule ought to apply to the entire roentgen equipment. The speaker had already thought out an equipment of this kind, providing for a dark room and developing facilities, extra supply of water, tank on the roof, etc., and this roentgen truck should be operated independently of other motor vehicles, but it could not be used at the front because it would draw the attention of the enemy. Consequently, the base hospitals should have more efficient and bigger apparatus than those to be used at the front. If there were one or more central points where a reasonable number of standardized machines could be stored, that might solve the problem as well as the difficulty of working in conjunction with the Red Cross service.

Dr. Coolidge had not come with the idea of making any recommendations, but was ready to suggest a test outfit in the first place, such as the Delco Company, of Dayton, are manufacturing on a very large scale. It is a direct connected gas engine and delivers about 1 kw of electrical energy. Certain alterations are now being made in a tentative way, so that, for instance, while the machine at present weighs 325 lbs. and runs at 1000 revolutions a minute, the weight is going to be reduced to 200 lbs. and it is made to run at about 1200 revolutions. Other alterations would follow suit with the idea of simplifying the outfit and make it workable in such a way as not to require any highly technical training of the assistant. This work is now going on, and if several different outfits are put into actual service and tested out, it would obviate the disadvantage of adopting a thing which had not been fully tested. This, however, required much experimental work.

In Dr. Caldwell's opinion the question of roentgen devices for war purposes was not as fully developed as many people supposed. It might be likened to the condition of the flying machine at the beginning of the war. The war was responsible for more developments in flying machines than peace times would have produced in twenty years, and similar conditions would probably obtain in the way of improving the present roentgen apparatus. As a general principle Dr. Caldwell agreed with Dr. Coolidge in regard to the advisability of simplifying the equipment, and he proceeded to throw out some suggestions in the matter of reducing the weight and bulk of the coils, of substituting handier tubes for the clumsy ones that are now in daily use, and of devising better methods of protection to the roentgenologist. He next touched upon the advantages of stereoscopy in connection with roentgenography, expressing regret at the slight headway this branch of the art had so far made.

Mr. Snook had brought with him a practical working unit and a practical plan, representing the present state of the art. It was one of the Delco units referred to by Dr. Coolidge. He had adapted a motor generator to the 30-volt direct current, delivering about 20 volts alternating current at sixty-cycle, single phase, which is transformed by a standard transformer. There are several hundred of these units in use in the tropics under the most adverse weather conditions, and they are equipped with an oil insulator. Mr. Snooks also exhibited a number of standard accessories. The basis of his plan was that, although the standard sixty-cycle single phase unit could be adapted to the Delco unit in this way, the motor generator and the small static transformer should be small and portable, and he believes that this task can be easily accomplished.

Dr. Waite stated that his firm had made a number of outfits for the army. At the present time they were making a transformer with the cooling reservoir on top. There would be no high tension carried to it at all, and there would be simply the alternating currents applied to the primary. The tube itself would be placed in a special glass container with a shutter arrangement on top, and it would not take up more room than the ordinary box which is now used to mount an ordinary roentgen tube.

Dr. Hickey exhibited a collapsible tube-stand which had stood the test of transportation. It was of the folding type, mounted on a firm base. It can be adjusted to any height or at any angle. It can carry any standard glass shift and hold the ordinary tubular type of diaphragm. The device has stood the test of a year's hard usage and will not get out of order when thrown into the back of an automobile.

Dr. Manges was anxious to see the system of equipments so standardized that articles could be carried on the backs of men or mules in the event of the automobile breaking down or the roads being impassable for cars. Major Huntington, however, thought that mules had a knack of breaking down as well as automobiles or anything else if subjected to hard usage, and the point simply emphasized his demand for well considered transportation. Unfortunately, the Staff Office, the Quartermaster's and the Medical Department constantly endeavored to cut down the expense of transportation and, therefore, if it was found that the Delco or any other kind of unit could do this work that would allow them to carry a sufficient number in a small space the difficulty would be largely met, and if the Delco Company could be induced to bring an outfit to Washington for inspection it would advance matters considerably.

At the motion of Dr. Lewald, seconded by Dr. Hickey, a Committee was appointed consisting of Drs. Coolidge, Caldwell, Major Huntington, Drs. Jacques, Hickey, Lyle, W. H. Stewart, and Percy Brown, for the purposes of reducing, if possible, the entire subject to a concrete form and to get a definite idea of what should and can be done to make the roentgen service an efficient aid to the Medical Department in times of war.

The Cure of Chronic Gastric and Duodenal Ulcer

Chicago, Ill., Feb. 23, 1917

To the Editor:

In reference to a review of my article on "The Modern Medical Treatment of Chronic Ulcer of the Stomach and Duodenum," which appeared under the heading of "Translations and Abstracts" in The American Journal of Roentgenology, January, 1917, page 639, permit me to comment as follows:

I do not believe nor did I so state that one can interpret the "absence of roentgenological symptoms as evidence of a cure." What I do believe and what I did state in my article is that the absence or disappearance of roentgen findings *in conjunction* with other clinical or laboratory findings may be taken as evidence of a

cure. In this article to which I would respectfully refer you, I grouped the roentgen findings with four other "evidences of cure," and stated that these five criteria may be used to judge of the cure or healing of a chronic ulcer. Permit me to quote from my article[1] as follows:

"The evidence of cure of chronic ulcer may be grouped as follows:

"(1) The disappearance or remission of the patient's *subjective* complaints.

"(2) The improvement in the *objective* appearance of the patient as gauged by his gain in weight, gain in hemoglobin, and in general well-being.

"(3) The improvement in the test-meal findings, diminution in the acidity, and the improvement in the motility as gauged by test-meals.

"(4) The disappearance of the occult blood in the stomach contents and stool, a point recently emphasized by Boaz.

"(5) The change in the *x*-ray and fluoroscopic findings, i.e., the actual disappearance of the ulcer, as in this case, or the changes in scar formation or in the stomach contour or in the type of peristalsis, pylorospasm, hour-glass contraction, and emptying time of the stomach as observed on the screen."

Please note that the *x*-ray findings are placed *fifth* in the series, which I believe is about where they belong—in relation to their importance when contrasted with the other clinical findings.

I might add further that since the publication of this article I have had three other cases of lesser curvature ulcer, the results of which are in accord with the findings as stated.

In regard to "the institution of this 'modern medical treatment' as a routine method for the cure of chronic penetrating gastric ulcer," I firmly believe that if economic reasons permit and if there is no danger of malignancy, perforation or hemorrhage, that *every* case (unless there is some other special contraindication in the individual case), should have the benefit of a preliminary medical management such as I have discussed in this article, provided such medical management is carried out in the *hospital*, where all necessary equipment is at hand in the event of any untoward accident such as perforation or hemorrhage. If in addition to the usual findings one will examine his patient before and after treatment (roentgenologically) he will be surprised at the marked changes which often parallel the usual clinical and laboratory findings.

While I do not anticipate for a moment that *all* lesser curvature ulcers will heal medically, I do not see how one can tell whether or not they will, without giving them the benefit of an actual trial. I would urge, therefore, as I did in my article that such trial be given and that the findings be controlled roentgenologically.

I should be much interested in seeing what this method of observation will reveal in the hands of other men.

Respectfully yours,

WALTER W. HAMBURGER.

[1] *The Medical Clinics of Chicago*, Volume 2, Number 3, page 428.

NURSES AS ROENTGENOGRAPHERS

According to the Paris letter in the *Journal of the American Medical Association* of March 10, 1917, the undersecretary of state of the military health service of France has decided to entrust the roentgenographic work to the nurses of certain sanitary formations. Therefore he has ordered the directors of the service to inform the temporary nurses in the military hospitals subject to their orders that a course in the theory and practice of roentgenography will soon be begun at the Edith Cavell School in Paris, under the direction of Mme. Curie.

This is a very important question and one which deserves careful consideration at the hands of the American roentgenological profession. Doubtless many of the mechanical steps in roentgenographic work can be entrusted to non-medically trained individuals, provided they keep their places. One reason for the increase in the

number of non-medical roentgenographers is the scarcity of medically trained men to do this work. Not enough competent medical men (clinically) see a field in roentgenological work; and as a result more or less demands are made upon laymen to fill the bill, even if inadequately. This is a question which needs careful study and it is hoped that in the future there will be communications from our members upon this subject.

French Roentgenological Activities

The Société de Radiologie Médicale de France held an Extraordinary Meeting on March 3, 1917, "at 16 o'clock," in Paris, for the purpose of discussing the applicability and usefulness of the roentgen rays in connection with the war. The Under-Secretary of State for Public Health presided, and no less than seven papers had to be read and discussed in the course of the afternoon. One of the most far-reaching papers was read by Béclère, who demanded that only physicians should be entrusted with the direction of the roentgen manipulations, although it may be admitted that in the exigencies of war some allowance will have to be made on the principle of a mere roentgenologist being better than no physician. A further report of the discussion will be published later.

Ledoux-Lebard explained the various methods of extracting projectiles under the guidance of the roentgen ray both anteriorly and posteriorly, while Rechou dealt with roentgen therapy of injuries peculiar to modern warfare. Belot described his and other methods of determining the exact locality of a foreign body in the eye.

Delherm informed the meeting on the results of the roentgen diagnosis of recruits suspected of pulmonary tuberculosis and the rôle the roentgen method was playing in securing the services of soldiers who would otherwise be exempt. Aubourg and Barret described the types of roentgen equipments used on and about the battlefield, and the same authors demanded in a second paper that the roentgenologist should have a free hand in deciding upon the diagnostic procedures to be instituted in the interests of saving plates.

A number of questions on different subjects connected with roentgenology and a general discussion brought the proceedings to a close.

SOCIETY PROCEEDINGS

Notice

The Program Committee for the Annual Meeting of the American Roentgen Ray Society, to be held in Pittsburgh, September 19–22, has decided to devote one session of the meeting to a Lantern Slide demonstration of unique or interesting cases. These demonstrations are to be limited to five minutes each, and are to consist of a written clinical history and corroborative proof of the accuracy of the diagnosis. The manuscripts of these reports, together with a print, must be submitted to the Committee before a place on the program will be assigned. All of these reports when approved shall become the exclusive property of the association for publication in the Journal.

Lewis Gregory Cole, President
W. H. Stewart, Secretary

The Eighteenth Annual Meeting of The American Roentgen Ray Society will be held at the Hotel Schenley, Pittsburgh, Sept. 19–22, 1917.

Erratum

We regret very much to note an error in the April issue in connection with the numbering and placing of the cuts of Dr. Cole's article. Figure 1 should be Figure 3; Figure 2 should be Figure 1; Figure 3 should be Figure 2.

TRANSLATIONS & ABSTRACTS

DE QUERVAIN, F.: Diverticulum of the Stomach Following Gastric Ulcer. (*Mitt. a. d. Grenzgeb.*, 1915, Vol. XXVIII, 690. Ref.: *Prog. Méd.*, Dec., 1916, Vol. XIX, p. 26.)

Long before the roentgenologic era it was recognized that certain anatomical changes in the stomach would be productive of diverticula. Since the *x*-ray examination has been universally employed, it was found for the first time by Haudek that certain "Nischenbildungen" (niche formations) and even true diverticula were not a rare accompaniment of perforating gastric ulcers. Strauss recognizes that such pathological conditions do exist, but believes they occur extremely rarely, while de Quervain, in a relatively meager operative material, has encountered it twenty times. In these twenty cases, at operation there was found a projection or diverticulum of the stomach, extending either into the ligamentum hepatogastricum, or into the adherent liver or pancreas. The operative findings corresponded exactly with the *x*-ray reports. De Quervain disagrees with Strauss as to the infrequency of such niches, and believes that not rarely does a penetrating ulcer of the lesser curvature give rise to diverticulum formation.

In certain cases the ulceration, particularly in the region of the gastrohepatic ligament, eats into this ligament, giving rise only to a depression in the roentgenogram and at operation. Whether these depressions ultimately give rise to diverticula must be determined only after years of observation with the *x*-ray, an observation which for very good reasons cannot be made at the present. That such diverticulum formation can arise, de Quervain believes probable, since in one case he found in a roentgenogram, above the middle of the lesser curvature, a pronounced niche, and another anomaly about 8 cm. lower, which he could not decide from the plate alone, whether it was a beginning niche or but an evidence of contraction. At operation it was found that the uppermost ulcer had produced a true niche, while the lowermost had given rise only to a depression, representing steps in the same process.

In other cases another method of production seems to take place: If an ulcer perforates, depending on the size of the perforation and on the amount of material in the stomach, there results either an extensive invasion of the peritoneal cavity or merely an area of local inflammation, which is immediately surrounded by fibrin and which gives rise to circumscribed perigastric abscess. Sometimes it is only the space between the liver, the anterior wall of the stomach and the ligamentum hepatogastricum which is invaded; in other cases it is the bursa omentalis minor, and even the entire subphrenic space. The abscess cavity finally leads to outgrowth of the stomach wall, in time leading to a niche and finally to diverticulum formation. In the majority of his cases de

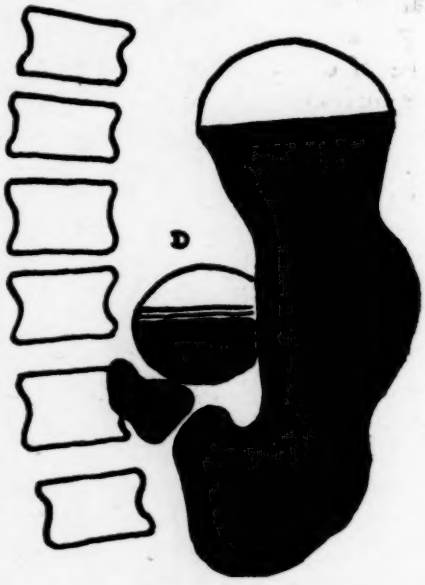


FIG. 1.—TRACING FROM ROENTGENOGRAM OF DIVERTICULUM OF STOMACH.

Quervain finds a history of pain lacking, which inclines him to the belief that such a method of formation must be infrequent. He reminds us, on the other hand, of the rarity of pain in minute perforations.

DE LABORIE, BRUNEAU: Osseous Lesions Which Can Not Be Detected Roentgenoscopically. (*Paris Médicale*, August 19, 1916, p. 162.)

Roentgenoscopy, which is the method of choice for the examination of the viscera, heart,

lungs, stomach, intestines, etc., is in certain cases quite unable to give even an approximate idea of osseous lesions which roentgenography clearly reveals. The same applies to foreign bodies, but that point will be dealt with in a later article.

When there is a question of small bones, such as the metacarpals, phalanges and of the root of the hand generally, there is nothing surprising in the fact that roentgenography is required to visualize them, but if we come to massive bones like the radius, humerus, tibia, etc., one should think that the smallest lesions would appear on the screen, but their absence is hastily misconstrued. The roentgenologist should in these cases follow the clinical indications and not deny a lesion unless a good roentgenogram proves the integrity of the bone tissue.

The cuts accompanying the article represent cases where roentgenoscopy did not disclose any lesions which clinical findings had suspected to exist, while roentgenography solved the question in favor of the latter.

A fracture of the tibia was not accompanied by any displacement and was not visible on the screen.

Fractures of the malleoli, especially of the external malleolus, are likewise often mistaken in roentgenoscopy. The patient is sent to the roentgenologist for a "torsion of the tibio-tarsal articulation," and the roentgenogram shows in a great many cases a malleolar fissure. Another illustration shows a fissure of the acromion without displacement in a soldier who had been found wounded, entombed in the trenches. The roentgenogram also shows a slight osseous tear at the level of the ligamental insertion of the humerus.

The lesions of osteitis are often still more difficult to diagnose, even at the level of easily accessible bones. The first metatarsal bone is the seat of very clear osseous lesions, accompanied by osseous rarefaction, which are especially visible at the level of the small articulations.

When regions with thick tissues are concerned, osteitis presents more difficulties yet, and any lesions that may be present can only be discerned in a very fine roentgenogram. One of the illustrations shows a focus of osteoarthritis of the left sternoclavicular articulation, which had been clinically suspected, and roentgenographically confirmed.

Another roentgenogram represents a focus of osteitis of the sacrum with sequesters, following the passage of a projectile. During the operation numerous small bone fragments were removed by the curet.

From these few examples it is easy to see that the absence of lesions can not be established from even the most careful roentgenoscopic (fluoroscopic) examination and that, whenever the clinical findings give rise to the slightest doubt, roentgenography should be resorted to. The latter procedure is the most precise method of examination which can be applied in these cases.

BRUNEMEYER, E. H., AND CARLSON, A. J.: Contributions to the Physiology of the Stomach: Reflexes from the Intestinal Mucosa of the Stomach. (*Amer. Jour. Physiol.*, Vol. XXXVI, No. 2, January, 1915, p. 191.)

Gastric juice, chyme, acids, alkalies, water, milk and oil introduced into the small intestine inhibit gastric hunger contractions and gastric tonus for varying periods. This is due partly to mechanical and partly to chemical stimulation of the intestinal mucosa. The chemical stimulation produces the greater effect. The inhibition apparently takes place primarily by the "long" or central reflex path, although "short" or local reflex paths in Auerbach's plexus are also involved.

ROGERS, FRED. T.: Contributions to the Physiology of the Stomach: The Contractions of the Rabbit's Stomach During Hunger. (*Amer. Jour. Physiol.*, Vol. XXXVI, No. 2, January, 1915, p. 183.)

During starvation of the rabbit, the stomach is never empty under normal conditions. When deprived of food and so fixed that the animal can not eat its feces, the stomach empties itself in about twenty-four hours in adult animals. During starvation, the gastric activities are increased and the gastromotor reflexes are different from those of normal peristalsis, but there are no sharp dividing lines between normal peristalsis and the contractions occurring during hunger. It would thus seem that, in the rabbit at least, the gastric hunger contractions are intensified digestive peristalses.

The empty stomach of the rabbit shows very strong and rapidly repeated contractions and marked tonus variations. In the hungry animal there is a state of increased tonus in the stomach musculature. Tonus changes are more marked and occur more frequently during hunger than during normal digestion peristalsis. The contractions of the stomach during hunger are not inhibited by the sight, smell, taste or chewing of food. The hunger contractions are inhibited or weakened by small quantities of water, weak acids, alcohol or sugar solutions, introduced into the stomach. Normal peristalsis is not inhibited by the same amounts of these solutions.

Central nervous excitation inhibits the gastric contractions, causing a lowering of the tonus of the gastric musculature.

RANSOHOFF, JOSEPH, AND RANSOHOFF, J. LOUIS: Radium Treatment of Uterine Cancers. (*Annals of Surgery*, Vol. LXIV, No. 3, Sept., 1916, p. 298.)

It is merely an academic question, according to the Ransohoffs, whether the action of radium on neoplastic tissues of the uterus is specific or whether it is due to the great cell richness of the latter. All things being equal, the action of radium on tissue is in proportion to the abundance of nuclei, and the more closely the tissue approaches the embryonal type the more amenable will it be to the radium treatment. This accounts for the better results in lymphosarcoma than in periosteal or chondrosarcoma.

The uterus presents an unusually fertile field for radium therapy, partly from the histologic structure of uterine cancer but particularly because of its unusual accessibility. The primary results of radium therapy in this field have even exceeded the hopes of a few years ago. The reports grow more and more encouraging, and the question of the entire replacement of panhysterectomy by radium therapy for cancerous conditions may soon come up for final solution.

There are many methods of applying radium to cancers of the uterus according to the contour of the growths. The authors vary their methods, using a disk-like brass filter where there is a broad ulcerating surface, and a cylindrical one where there is a disposition to crater formation. The immediate local results are phenomenal. In from one to three weeks the hemorrhage is arrested and the foul discharge stopped. Cauliflower vegetations in the vagina seem to melt away, and pain is sometimes relieved within a few days. The most difficult cases are those which recur after a Wertheim operation, the fibrous tissue scars being almost impervious to the rays. However, 11 out of 25 such cases are still well after the lapse of varying periods: 3 have been well for 2 years, 6 for 1 to 2 years, and 2 from 6 to 12 months. Of 11 clinical recoveries, 3 were operable, 1 of which is well after 2 years and 2 over 1 year. Although the cases are few, the result is gratifying to the authors.

Inoperable cases should always have the benefit of radium treatment, and the same refers to borderline cases. Hysterectomy after a clinical radium cure should not be undertaken as being extremely difficult and dangerous.

BROWN, PHILIP KING (San Francisco): Clinical Manifestations of Unusual Lesions in the Abdomen. (*International Clinics*, Vol. II, Series 26, 1916.)

In view of the fact that surgery is too often resorted to to make a diagnosis in severe and unusual disturbances in the abdomen, often leading to physical alterations of the organs to the detriment of the patient, Dr. Brown has collected a number of cases where roentgenography has done efficient service. All the cases described have occurred at the St. Francis Hospital, San Francisco, and the excellent roentgenograms accompanying the article—twenty-two in number—have been made by Dr. W. P. Burnham, to whom the author is also indebted for their interpretation.

The illustrations show that roentgenological examination disclosed the following conditions: Location of pus in the subphrenic region; the presence of air bubbles above the line of fluid, in the erect position; the motionless and high diaphragm and relatively slight pleural disturbance above, as a help in determining the location of the abscess; the mechanical difficulties in gastric motility and the changes in outline of the stomach from tumor and ulcer, from pressure on pylorus and duodenum from without, through a large cyst of the right kidney, and from gallbladder adhesions; syphilis of the stomach; intestinal diverticula eight years after an operation which revealed localized peritonitis and a mass suggesting cancer; cancer of the sigmoid, plainly shown in the

plates one year before operation was done which confirmed the roentgenological diagnosis; macrosigmoid and volvulus.

The author goes at length into the details of pathological histories where the clinical findings were misleading and where a roentgen examination cleared up the diagnosis—or might have done if it had been resorted to. At the same time, he does not fail to place proper emphasis on the necessity of the roentgenograms and their interpretation being entrusted to competent hands, as in those of the unskilled the pictures may be made to prove almost any condition and thus form a dangerous tool in diagnosis.

JACOBSON, J. H.: Recent Progress in the Treatment of Uterine Cancer. (*Jour. Am. Med. Assn.*, Vol. LXVII, No. 17, Oct. 21, 1916, p. 1219.)

Although the author has a strong leaning toward surgery in the treatment of uterine cancer, he keeps an open mind for the newer methods of Percy's coagulation and radiotherapy as practiced with radium and the roentgen ray. Indeed he considers combined methods, such as operation followed by the use of roentgen rays or radium to be the most logical in certain cases and as instances describes the first two cases in his own practice. He treated his first case, cancer of the vaginal portion of the cervix, in 1907 in conjunction with H. W. Dachtler, by the abdominal method. There was a carcinomatous infiltration into the right broad ligament which was not removed at operation. The patient was thoroughly treated by roentgenization after the operation, and the mass in the broad ligament entirely disappeared. The patient is alive and well nine years after the operation. The second patient was operated on in August, 1913, for cancer of the body of the uterus, with extension of the disease into the iliac and lumbar lymphatic glands. These glands were removed and microscopic examination showed them to be malignant. The case was one which is generally considered hopeless, as recurrence is always the rule. Postoperative roentgen treatments were most thoroughly applied both through the vagina and abdomen. The patient is now in good health three and a half years after the operation.

The author has performed typical Wertheim operations on 20 patients, among whom there have been 5 deaths. Thirteen of these patients have had systematic post-operative roentgen applications. Three are alive and have been free from recurrence for more than five years, two for three years, three for two years, and two for one year.

DEAVER, JOHN B.: Operative Treatment of Fibromyomatous Uterine Tumors. (*Jour. Am. Med. Assn.*, Vol. LXVII, No. 17, Oct. 21, 1916, p. 1216.)

Dr. Deaver's article, which is entirely in favor of surgery, palliative or radical, for the treatment of uterine fibroids, would constitute a formidable condemnation of roentgen and radium treatment in this affection, if he furnished more substantial reasons than his disbelief in the reported successes of that method. He argues that a patient treated by radium, even though symptomatically improved, still has her fibroid, for he does not "take seriously the claim that such tumors disappear under the influence of the radiations," for the reason that he has done too many surgical operations to believe in such efficacy. He admits the possibility, however, of the blood supply of the uterus and its contained tumors being checked, the growth of the tumor arrested and its size reduced in a few favorable cases owing to the "more or less obscure relations existing between ovarian function and pelvic congestion." He is even willing to grant a certain effect of the rays on the tumors themselves, but thinks it is unfortunate that this is not a specific effect. So while both roentgen and radium treatment result in beneficial changes, these facts do not, in the author's opinion, point to radiation as the treatment of choice. "We consider it malpractice to employ these measures in any case amenable to excision."

Dr. Deaver asks whether it is justified running after this new prophet—radium—which "to our mind" is about to prove itself as false as those which have preceded. He further discounts the future by concluding, now that sufficient time has elapsed, that many failures are to be expected with the roentgen treatment and that a certain amount of positive harm can come from it. He does not point out any such cases, although "sufficient time has now elapsed" to expect them. On the contrary, in his opinion we are now justified in asserting that both the roentgen ray and radium have failed to demonstrate specific power over fibroid

growth, but he fails to state the reasons on which such justification is based.

As to operative deaths, the author says that in the majority of instances they are due to infection and complications: peritonitis, paresis of the bowel, pneumonia, myocarditis, asthenia, cardiac failure, shock. Against this list he can not allow the advocates of radium to urge their procedure as possessing no mortality. He claims surgery to be the only cure of malignant disease, and in a certain series of cases which he communicates, the malignant degenerations exceeded the mortality percentage. "Therefore," he concludes, "any treatment other than operation should be credited with this mortality, since it deprives the patient of his only hope of cure." Moreover, he considers it certain that "these damaged organs if left *in situ*" would inevitably in a large percentage of cases become the seat of malignant disease, and the prevention of such changes by removal actually places a balance to the credit of operation, while it further condemns so-called conservative treatment.

It is certainly a relief to note at the conclusion of the article that the operation for the removal of fibroid tumors has been to Dr. Deaver one of the most satisfactory in all surgery.

MORIARTA, DOUGLAS C.: Radium and Symptomatic Blood Pressure. (*Med. Rec.*, Vol. 89, No. 20, May 13, 1916, p. 865.)

Moriarta has learned to value the Saratoga mineral waters as a therapeutic agent very highly. While fully appreciating the effect of other clinical and dietary treatment, including Kellogg's low-protein diet, he sees an additional effect when these waters are used therapeutically. Also the remote effect was noticeable, consisting in general betterment months after taking a course of treatment, and it has seemed to him that the improvement can not be entirely accounted for by the chemical analysis. He now believes that this remarkable action is due to radium contained in the waters.

He has found the blood pressure of a patient taking the cure to drop from 20 to 60 mm Hg in from 4 to 6 weeks almost without fail, excluding those in whom advanced arteriovascular or renal degeneration existed. All etiological conclusions concerning the symptomatic blood pressure point to perverted metabolism as the primary cause, regardless of the pathological symptoms. Radium not only stimulates the individual normal cell, but also increases the red blood cells, increases renal elimination and stimulates intestinal peristalsis. Mineral waters containing radium salts or those that are radioactive, have their therapeutic properties materially increased.

Acting on the experience of European spas and the London Radium Institute, Moriarta has made arrangements to increase the radium content of the Saratoga mineral waters. In his article he gives a description of the equipment with illustrations and diagrams. During the past year he has treated 56 cases in which there was an increased blood pressure with radium emanation in addition to the Saratoga waters plus a regulated régime. These cases may be said to be too few to warrant the formation of an opinion concerning the possibilities of radium, particularly as over half of these patients were under observation only from 4 to 8 weeks; nevertheless, he believes that radium has shown to possess valuable therapeutic properties in this treatment. There was in every one of these cases, though in varying degrees, a lowering of blood pressure index and an increased red blood count, a few histories of cases illustrating these conclusions. Even in cases showing advanced structural changes in the kidney, heart, and blood vessels, improvement has been observed.

A course of treatment is commenced either with radioactive waters, radium inhalation or an intravenous injection of soluble radium salts. The radioactive waters are given in doses ranging from 25,000 to 100,000 Mache units of emanation per day in divided doses after meals and at bed time. Radium inhalation is given daily in the emanatorium for a period of two hours in conjunction with varying amounts of radioactive water taken at the beginning and end of the sitting. Each liter of air contains 250 Mache units of emanation.

Soluble radium salts are ejected intravenously in selected cases either at the commencement of the treatment or when the response to the radioactive waters or emanations has not been sufficiently effective. A second injection is given two weeks later, the quantity being varied from 10 to 15 micrograms of radium chloride. This is always followed by a course of waters and inhalation. Large doses of emanation may cause headache and other dis-

turbances which demand temporary interruption of the treatment and resumption with about one-fourth the original dose. This is gradually increased until the desired effect is secured.

ABBE, ROBERT: Radium Efficiency in Non-Malignant Surgical Conditions. (*Med. Rec.*, Vol. 90, No. 2, July 8, 1916, p. 47.)

Radium treatment of a number of non-malignant surgical conditions which resist every other kind of treatment, forms the subject of Abbe's highly instructive and interesting paper. It chronicles the conditions and treatment in cases of vernal catarrh of the eyes, lymphoid tumor tissue of the tongue, vocal cord papillomata, warts in delicate places, leukoplakia of the mouth, abraded ulcer of the lips, overgrowth keratosis, nevi, keloids, uterine fibroids and lupus erythematosus.

Ten cases of vernal catarrh—an affection considered intractable by oculists and physicians alike—derived uniform benefit and ultimate cure at the author's hands by a fifteen-minute application of a tube of strong radium under the eyelid, moved back and forth, a lead device protecting the cornea and a drop of cocaine deadening the pain. The selective action of radium on lymphoid cell growth, such as is found in tumors of the tongue, and in other parts of the body, is emphatically specific. Vocal cord papillomata have subsided, leaving perfect vocal cords five years after apparently hopeless conditions. The disappearance of warts in delicate places is classified by the author with specific action inasmuch as a retrogression of wrong-growing cells takes place. In the cure of leukoplakia there is a transient painful irritation which, however, is essential to success and should give rise to no complaint, since no cure whatever was known for this affection before the advent of radium.

It seems paradoxical, as the author puts it, that in an overgrowth keratosis and a deficient growth, as in chronic thin surface ulcer or abrasion of the lips, the same agent acts curative, and the fact can not be explained until we know why cells grow. He attributes it to "something" being driven into them by the radium application. Science is about ready to concede that the actuating force of nerve and cell activity is electrical, and radium almost wholly discharges particles bearing a charge of electricity. But in what the specific action consists, we can only speculate.

In nevus, the action of radium is curative by irritation, although patience and discretion are needed to keep the skin velvety and prevent the formation of a cicatricial atrophy from over-treatment. The inflammation thereby produced is especially noticeable in keloids, both the true and the false forms being easily cured in cases where no surgeon would dare cut out.

The effect of radium on uterine fibroids has impressed the author as the most remarkable of all. Surgeons have but one answer to these sufferers: Cut them out—usually with the uterus. The result is often disastrous, while so simple a treatment as the introduction of a small tube of radium into the uterine cavity, without ether, for two hours on two or three occasions, and without the patient entering the hospital, stops the excessive hemorrhage and causes the tumor to shrink and disappear. Accumulated cases show that the cure is permanent. It sounds like a Muenchhausen tale.

Abbe presented a patient who had had extensive lupus erythematosus of the entire face, ears and side of the neck and of his hands, who was cured by one thorough radium treatment. This case, as the author explains, does not stand alone.

DELAVAN, D. BRYSON: Radium in the Field of Laryngology. (*Med. Rec.*, Vol. 90, No. 2, July 8, 1916, p. 50.)

The fact that but few reports on the gratifying effect of radium in the treatment of the upper air passages have so far been published, is attributed by Delavan to the reluctance of the profession to report cures when too little time has elapsed to prove their permanency. Thus, the failure to gain reliable results in carcinoma is, in the author's opinion, due to our imperfect knowledge of the methods by which the radiations can be controlled, of the amounts of radium which should be used and of the correct duration of the exposures. But the important principle has been proved that under proper application radium will destroy a superficially located cancer cell, and Delavan considers it by no means impossible that, with increased knowledge, of its action and skill in application, deeply seated cells may be successfully reached and destroyed, without injuring the surrounding tissue.

growth, but he fails to state the reasons on which such justification is based.

As to operative deaths, the author says that in the majority of instances they are due to infection and complications: peritonitis, paresis of the bowel, pneumonia, myocarditis, asthenia, cardiac failure, shock. Against this list he can not allow the advocates of radium to urge their procedure as possessing no mortality. He claims surgery to be the only cure of malignant disease, and in a certain series of cases which he communicates, the malignant degenerations exceeded the mortality percentage. "Therefore," he concludes, "any treatment other than operation should be credited with this mortality, since it deprives the patient of his only hope of cure." Moreover, he considers it certain that "these damaged organs if left *in situ*" would inevitably in a large percentage of cases become the seat of malignant disease, and the prevention of such changes by removal actually places a balance to the credit of operation, while it further condemns so-called conservative treatment.

It is certainly a relief to note at the conclusion of the article that the operation for the removal of fibroid tumors has been to Dr. Deaver one of the most satisfactory in all surgery.

MORIARTA, DOUGLAS C.: Radium and Symptomatic Blood Pressure. (*Med. Rec.*, Vol. 89, No. 20, May 13, 1916, p. 865.)

Moriarta has learned to value the Saratoga mineral waters as a therapeutic agent very highly. While fully appreciating the effect of other clinical and dietary treatment, including Kellogg's low-protein diet, he sees an additional effect when these waters are used therapeutically. Also the remote effect was noticeable, consisting in general betterment months after taking a course of treatment, and it has seemed to him that the improvement can not be entirely accounted for by the chemical analysis. He now believes that this remarkable action is due to radium contained in the waters.

He has found the blood pressure of a patient taking the cure to drop from 20 to 60 mm Hg in from 4 to 6 weeks almost without fail, excluding those in whom advanced arteriovascular or renal degeneration existed. All etiological conclusions concerning the symptomatic blood pressure point to perverted metabolism as the primary cause, regardless of the pathological symptoms. Radium not only stimulates the individual normal cell, but also increases the red blood cells, increases renal elimination and stimulates intestinal peristalsis. Mineral waters containing radium salts or those that are radioactive, have their therapeutic properties materially increased.

Acting on the experience of European spas and the London Radium Institute, Moriarta has made arrangements to increase the radium content of the Saratoga mineral waters. In his article he gives a description of the equipment with illustrations and diagrams. During the past year he has treated 56 cases in which there was an increased blood pressure with radium emanation in addition to the Saratoga waters plus a regulated régime. These cases may be said to be too few to warrant the formation of an opinion concerning the possibilities of radium, particularly as over half of these patients were under observation only from 4 to 8 weeks; nevertheless, he believes that radium has shown to possess valuable therapeutic properties in this treatment. There was in every one of these cases, though in varying degrees, a lowering of blood pressure index and an increased red blood count, a few histories of cases illustrating these conclusions. Even in cases showing advanced structural changes in the kidney, heart, and blood vessels, improvement has been observed.

A course of treatment is commenced either with radioactive waters, radium inhalation or an intravenous injection of soluble radium salts. The radioactive waters are given in doses ranging from 25,000 to 100,000 Mache units of emanation per day in divided doses after meals and at bed time. Radium inhalation is given daily in the emanatorium for a period of two hours in conjunction with varying amounts of radioactive water taken at the beginning and end of the sitting. Each liter of air contains 250 Mache units of emanation.

Soluble radium salts are ejected intravenously in selected cases either at the commencement of the treatment or when the response to the radioactive waters or emanations has not been sufficiently effective. A second injection is given two weeks later, the quantity being varied from 10 to 15 micrograms of radium chloride. This is always followed by a course of waters and inhalation. Large doses of emanation may cause headache and other dis-

turbances which demand temporary interruption of the treatment and resumption with about one-fourth the original dose. This is gradually increased until the desired effect is secured.

ABBE, ROBERT: Radium Efficiency in Non-Malignant Surgical Conditions. (*Med. Rec.*, Vol. 90, No. 2, July 8, 1916, p. 47.)

Radium treatment of a number of non-malignant surgical conditions which resist every other kind of treatment, forms the subject of Abbe's highly instructive and interesting paper. It chronicles the conditions and treatment in cases of vernal catarrh of the eyes, lymphoid tumor tissue of the tongue, vocal cord papillomata, warts in delicate places, leukoplakia of the mouth, abraded ulcer of the lips, overgrowth keratosis, nevi, keloids, uterine fibroids and lupus erythematosus.

Ten cases of vernal catarrh—an affection considered intractable by oculists and physicians alike—derived uniform benefit and ultimate cure at the author's hands by a fifteen-minute application of a tube of strong radium under the eyelid, moved back and forth, a lead device protecting the cornea and a drop of cocaine deadening the pain. The selective action of radium on lymphoid cell growth, such as is found in tumors of the tongue, and in other parts of the body, is emphatically specific. Vocal cord papillomata have subsided, leaving perfect vocal cords five years after apparently hopeless conditions. The disappearance of warts in delicate places is classified by the author with specific action inasmuch as a retrogression of wrong-growing cells takes place. In the cure of leukoplakia there is a transient painful irritation which, however, is essential to success and should give rise to no complaint, since no cure whatever was known for this affection before the advent of radium.

It seems paradoxical, as the author puts it, that in an overgrowth keratosis and a deficient growth, as in chronic thin surface ulcer or abrasion of the lips, the same agent acts curative, and the fact can not be explained until we know why cells grow. He attributes it to "something" being driven into them by the radium application. Science is about ready to concede that the actuating force of nerve and cell activity is electrical, and radium almost wholly discharges particles bearing a charge of electricity. But in what the specific action consists, we can only speculate.

In nevus, the action of radium is curative by irritation, although patience and discretion are needed to keep the skin velvety and prevent the formation of a cicatricial atrophy from over-treatment. The inflammation thereby produced is especially noticeable in keloids, both the true and the false forms being easily cured in cases where no surgeon would dare cut out.

The effect of radium on uterine fibroids has impressed the author as the most remarkable of all. Surgeons have but one answer to these sufferers: Cut them out—usually with the uterus. The result is often disastrous, while so simple a treatment as the introduction of a small tube of radium into the uterine cavity, without ether, for two hours on two or three occasions, and without the patient entering the hospital, stops the excessive hemorrhage and causes the tumor to shrink and disappear. Accumulated cases show that the cure is permanent. It sounds like a Muenchhausen tale.

Abbe presented a patient who had had extensive lupus erythematosus of the entire face, ears and side of the neck and of his hands, who was cured by one thorough radium treatment. This case, as the author explains, does not stand alone.

DELAVAN, D. BRYSON: Radium in the Field of Laryngology. (*Med. Rec.*, Vol. 90, No. 2, July 8, 1916, p. 50.)

The fact that but few reports on the gratifying effect of radium in the treatment of the upper air passages have so far been published, is attributed by Delavan to the reluctance of the profession to report cures when too little time has elapsed to prove their permanency. Thus, the failure to gain reliable results in carcinoma is, in the author's opinion, due to our imperfect knowledge of the methods by which the radiations can be controlled, of the amounts of radium which should be used and of the correct duration of the exposures. But the important principle has been proved that under proper application radium will destroy a superficially located cancer cell, and Delavan considers it by no means impossible that, with increased knowledge, of its action and skill in application, deeply seated cells may be successfully reached and destroyed, without injuring the surrounding tissue.

The Radium Institute of London states that radium treatment of the buccal, lingual and pharyngeal mucous membranes does not seem to have much effect in arresting the disease, but the author attributes significance to the added remark that "under new methods of application better results may be expected." On the other hand, the Royal Infirmary, while admitting the failure of effecting a cure in advanced malignant cases, is satisfied with the benefits derived from the relief of pain, the cessation of discharges, the healing of ulcerative surfaces, the removal of local growths and the prolongation of life.

Delavan cites a few favorable results attained by himself and others. In two of his own cases which were almost exactly alike, the disease—epithelial carcinoma—had invaded the interior of the larynx, the left lateral wall of the pharynx, the pyriform sinus, the tonsil and the base of the tongue. There were ulcerations, aphonia and dysphagia. Operation was impossible. Large doses of radium were applied, the first effect of which was an almost immediate control of the secretions. The ulcerative areas rapidly diminished, and in the less severe of the two cases disappeared. The extensive swellings decreased markedly and the infiltrated tissues were reduced in size, became soft to the touch and more natural in appearance. The functions of the throat improved, the voice became clearer and both patients were now able to swallow without pain. There was improvement in general health, digestion became normal and sleep more prolonged and restful. A steady increase of strength was apparent, together with a rapid return to an almost normal condition of good spirits. One of these patients was a physician who was able to resume his office practice and for two months remained steadily at work.

The author regards the general outlook of radium treatment in laryngology from a hopeful and optimistic point of view.

Boggs, Russell H.: The Treatment of Leukoplakia by Radium. (*Texas Med. Jour.*, November, 1916, p. 224.)

The article deals only with leukoplakia of the mouth, idiopathic and syphilitic. The affection, according to the author, is never the trivial lesion which it is described to be in textbooks: it is frequently the forerunner of epithelioma and should always be seriously considered. Radium affords the best form of treatment we possess, even when the affection has become epitheliomatous, although the syphilitic type does not respond as readily as true idiopathic leukoplakia. The effects of iodide in the latter type are deplorable, and all irritating treatment, including cautery, is contraindicated. Gargles and medication are waste of time.

The best results of radium treatment are obtained by the rays of low penetration, as it is not necessary to have a reaction deeper than one or two millimeters. The author has used ½ mm of silver, several layers of gauze and a finger cot as a filter, which allows of a large amount of beta rays to be used. Whether this is absolutely essential he is unable to state, but with this amount of filtration the time of exposure can be considerably reduced. Using a tube containing 25 mg of the element, one to two hours' application is usually sufficient for each lesion, depending upon its stage and extent.

X-Rays as Demonstrative Evidence. (*Med. Rec.*, May 13, 1916, p. 877.)

In an action for malpractice, where there was positive testimony that the plaintiff's arm was in the same condition when *x*-ray photographs were taken as it was when treated by the physician, it was held that such photographs were admissible in evidence notwithstanding there was other testimony as to an intervening injury to the plaintiff's arm.—Ligon v. Allen, Kentucky Court of Appeals, 181 S.W. 656.

Dixon, George Sloan: Roentgen Ray Diagnosis of Mastoid Disease. (*Am. Jour. Electrother. and Radiol.*, December, 1916, p. 593.)

A roentgen examination of the mastoid is not only valuable in confirming the clinical findings but it may even overrule the latter and demand an operation when clinical symptoms do not warrant it. Thus, in the latter case repeated roentgen examinations will show whether the case is clearing up or not. If at the first examination the mastoid is hazy, the septa clear, and there are no ragged areas, and if at subsequent exposures it is found cloudy and the

septa are less distinct and consequently becoming soft, or if cavities are discovered where there were none before, then the patient is entitled to an operation, no matter what the clinical symptoms are. As a general rule, however, the roentgen report, whether positive or negative, should only be regarded as one point in the diagnosis, but the surgeon should consult with his radiologist and not accept the written report and draw his own conclusions. The author proceeds to lay down the technic evolved by him, having made the examination a routine measure, and emphasizes the necessity of taking roentgenograms of both sides for comparison. In asymmetrical cases (which occurred in 14.5 per cent. of the author's series of 522 consecutive cases) the reading is much more difficult than when the two mastoids are practically the same, and it will then be necessary to go into the pathological history to interpret the picture correctly.

Roentgen examination of the mastoid has gone through the customary periods of exaggeration and reaction, but has now settled down to its true value and is accepted on its merits.

RUGGLES, HOWARD E., San Francisco: Roentgen Treatment of Localized Pyogenic Infections. (*Calif. State Jour. Med.*, Vol. XIV, No. 12, December, 1916, p. 486.)

Instigated by the success of Dunham, of Cincinnati, in the treatment of 67 cases of carbuncles by means of the Coolidge tube, the author applied the same method with the following results, in eight cases.

One therapeutic dose arrested the pain in a carbuncle 5 cm in diameter, in forty-eight hours, followed by profuse discharge, a slight crust remaining after two weeks. One treatment had the same effect, with moderate discharge and complete cure in ten days in a carbuncle 4 cm in diameter. A chronic induration 6 cm in diameter, following furuncle, showed marked improvement after one therapeutic dose; repetition with one-half dose completed the cure in two weeks. In two cases of furuncle, 3 cm in diameter, one treatment relieved the pain in twenty-four hours, with no discharge, complete cure following in one week. In two cases of folliculitis, with pustules appearing in crops of four to eight every two or three weeks, one therapeutic dose removed the infected hair follicles, since when there has been no further trouble. The last case was one of paronychia which was cured in four days, the pain having been relieved in eighteen hours, followed by slight discharge.

LE FORT AND GRANDGÉRARD: Tissue osseux de néoformation invisible à la radiographie. (*Bull. et mém. soc. de chir.*, 1916, XLII, 1192.)

Messrs. Le Fort and Grandgérard presented the fractured femur of a soldier amputated three months after his injury. A direct roentgenogram of the anatomical specimen taken with rays of slight penetrating power scarcely showed the enormous hard osteophytes developed around the bone fragments. These osteophytes were invisible on the roentgenoscopic examination of the thigh made before amputation. The periosteal reaction around a fracture or a projectile near the bone is slow, especially in old subjects, in collecting the calcareous salts which make it perceptible on roentgenological examination.

This well-known fact explains how a projectile, localized by roentgenography in the neighboring soft parts, can sometimes be localized and extracted only by chiseling away the newformed bone which surrounds it. Ignorance of this surgical fact may be a cause of some failures in the extraction of projectiles.

VIOL, CHAS. H.: The Nature of the Radio-Active Elements and their Radiations. (*Maryland Med. Jour.*, January, 1917, Vol. LX, p. 7.)

This very comprehensive article deals with the physics of radio-active materials in a thoroughgoing manner. The article is hardly susceptible of an abstract, but it is well worth careful study on the part of every reader of this journal.

BOOK REVIEWS

THE GROWTH OF MEDICINE FROM THE EARLIEST TIMES TO ABOUT 1800. By Alfred H. Buck, B.A., M.D., formerly Clinical Professor of Diseases of the Ear, Columbia University, New York; Consulting Aural Surgeon, New York Eye and Ear Infirmary, etc. Yale University Press, 1917. Price $5.00.

"In a newly settled country in which the population grows by leaps and bounds through the influx of foreign immigrants, the training of young men for the degree of M.D. must necessarily be almost entirely of a practical character, and consequently the teaching of such a subject as the history of medicine would be quite out of place." For this reason Dr. Buck thinks that up to the present time no blame may justly be attached to individuals or institutions for the fact that but few physicians in the United States and Canada possess even a slight knowledge of the historical phase of medicine, although he believes that this reason is now rapidly losing its validity if indeed it has not already ceased to exist. A second reason for the neglected study of medical history in English speaking countries is attributed to the ultrascientific character of the available English books on the subject which do not appeal to the undergraduate or the busy practitioner, and the object of the present volume is to overcome this drawback.

In this object the author has admirably succeeded. Taking the German medical histories of Max Neuburger and of Haeser as a basis, and borrowing occasionally from other authorities —a list of which is appended—he divides the history of medicine into nine parts: Primitive Medicine, the Medicine of the East, the Medicine of the Classical Period of Antiquity, the Medicine of the Hippocratic Writings, the Medicine of the Alexandria period, the Medicine of Galen, the Medicine of the Middle Ages, the Medicine of the Renaissance Period, and Modern Medicine dating from the 17th century to the present time. The last named period is subdivided into two sections at about the year 1775, and Buck's account does not cross that border-line into modern history.

The book is written in a lucid and concise style, and holds the interest of the reader from cover to cover. Abstruse medical phraseology has been avoided, so that the book will form a useful source of information not only to the physician but also to the educated layman.

ANNALS OF MEDICAL HISTORY. Francis R. Packard, M.D., Editor; Paul B. Hoeber, Publisher. Quarterly. Price $6.00 a year.

A new medical journal bearing the above title is about to make its appearance. This is an important undertaking, and under the able management of Dr. Francis R. Packard as editor, and Paul B. Hoeber as publisher, it deserves, and doubtless will receive, a very hearty welcome among medical men. Except for the publications of historical societies it is the only periodical in English devoted exclusively to the study of medical history, a study in which most physicians are taking more and more interest. It is hoped that the publication will find a niche of its own. The able editorial board which has been enlisted to assist Dr. Packard, and the specialists in the art of printing who have been engaged by Mr. Hoeber will insure the highest literary and artistic merit. As Dr. Osler has said, many problems in medicine can be approached profitably by the historical method alone. There is no doubt that the interest of medical men in literary and artistic matters bearing on medicine has steadily increased of late. This interest on the part of American medical men is manifested by the organization of historical clubs in the great medical centers like Baltimore, Boston, Chicago, Philadelphia and St. Louis, and by the recent establishment of a Historical Section by the New York Academy of Medicine.

It is to be hoped that in due time the editor of this publication will find room for articles dealing with the history of roentgenology.